MONITORING THE MIGRATIONS OF WILD SNAKE RIVER SPRING AND SUMMER CHINOOK SALMON SMOLTS, 1992

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EXECUTIVE SUMMARY

We PIT tagged wild spring and summer chinook salmon parr in the Snake River Basin in 1991, and subsequently monitored these fish during their smolt migration through Lower Granite, Little Goose, and McNary Dams during spring and summer 1992. This report details our findings, which are summarized below.

1) Collection and tagging procedures developed under a previous 3-year project funded by the Corps of Engineers (COE) continued to be highly effective and successful during summer and fall 1991.

2) We PIT tagged and released 12,086 wild spring and summer chinook salmon parr in 13 streams in Idaho and 3 streams in Oregon from late July to October 1991.

3) The total observed mortality from collection, tagging, and 24-hour delayed mortality was 1.6% for Idaho streams and 0.5% for Oregon streams. No PIT tags were lost during the 24-hour delayed mortality tests.

4) The percentage of released PIT-tagged fish subsequently detected in 1992 at the three dams (combined) was 10.8% and ranged from 5.4 to 20.7%, depending on stream of origin.

5) Significantly more wild fish were detected from Oregon streams (16.5%) than from Idaho streams (9.1%) ($P < 0.001$).

6) Fish that were larger at the time of release were detected at a significantly higher rate the following spring than their smaller cohorts ($P < 0.001$).

7) Wild fish outmigrating through the dams in April and May were significantly longer at time of tagging than fish outmigrating in June ($P < 0.001$). Since we observed this trend in all previous years, we believe that fish size may be an important factor influencing selection of overwinter habitat and/or the dynamics of smoltification.

8) Outmigration timing of wild spring chinook salmon at Lower Granite Dam was earlier overall than for the previous 3 years. The middle 80% of combined populations passed between 15 April and 27 May at Lower Granite Dam, between 21 April and 1 June at Little Goose Dam, and between 1 May and 1 June at McNary Dam.

9) Outmigration timing was earlier for wild summer chinook salmon than for wild spring chinook salmon at all three dams. The middle 80% of combined populations passed between 11 April and 26 May at Lower Granite Dam, between 18 April and 12 May at Little Goose Dam, and between 29 April and 31 May at McNary Dam.

10) Protracted arrival distributions and small sample sizes made it difficult to statistically quantify small differences in outmigration timing at Lower Granite Dam between fish from different streams. Consequently, the only statistically significant timing difference we detected between fish from different streams was the timing between the Imnaha River and upper Big Creek. The Imnaha River fish arrived at Lower Granite Dam significantly earlier than upper Big Creek fish ($P < 0.05$).

11) Peak passage periods of the combined populations of wild spring and summer chinook salmon did not coincide with peak river flow periods at Lower Granite Dam, but did coincide with peak river flow periods at Little Goose and McNary Dams,

12) Unusually warm weather and high water temperatures in late winter and spring appeared to result in an earlier outmigration timing for all wild smolts in 1992.

13) Die1 timing of wild chinook salmon smolts passing from the fish and debris separators varied among dams over the migration season. Slightly more fish exited the fish and debris separators at Lower Granite and Little Goose Dams during daylight hours than at night; however, more than twice as many fish exited the fish and debris separator at McNary Dam during daylight hours than at night.

14) There is a dire lack of environmental information on study streams in Idaho and Oregon. Only five U.S. Geological Survey stations recorded flow information in these streams, and no continuous water temperatures were taken on any of the streams.

INTRODUCTION

Project Goals

The goals of this study are to 1) characterize the outmigration timing of different wild stocks of spring and summer chinook salmon smolts at dams on the Snake and Columbia Rivers, 2) determine if consistent patterns are apparent, and 3) determine what environmental factors influence outmigration timing.

Background

The Snake River drainage once produced a relatively stable and viable population of spring and summer chinook salmon. Raymond (1988) estimated that prior to 1970, combined populations of wild spring and summer chinook salmon smolts arriving annually at Ice Harbor Dam ranged from 1.3 to 2.0 million. With virtually no programs in place for their protection during dam passages, these wild populations produced adult returns ranging from 50,000 to 79,000 fish, with an average return rate of 4.4%.

However, major problems developed during the 1970s that severely impacted these wild populations during their migrations through the hydroelectric complex. In the early 1970s, three additional dams were completed on the lower Snake River. Concomitantly, gas supersaturation caused by spilling excess water during average-to-high flows was identified **as** a major cause of mortality affecting both adult and juvenile migrants (Ebel et al. 1975). The opposite extreme also occurred during this period. Severe droughts in the Snake River during 1973 and

1977 were associated with catastrophic losses of smolts, although the losses were probably related more to poor passage conditions at dams than to low flows. Moreover, during the latter part of the decade, mortalities and injuries associated with certain components of newly installed collection and bypass facilities at Lower Granite, Little Goose, and McNary Dams likely decreased survival.

The spawning escapement trends from 1960 through the early 1980s chronicle the rapid decline in wild population (White and Cochnauer, in press). During 1960-70, redd counts in the Middle Fork of the Salmon River index areas averaged 1,603 redds (.1,026-2,180), but from 1971 to 1978, the counts dropped to an average of 683 redds (221-1,348). During the next 6 years (1979-84), counts plummeted to an average of 142 redds (38-195). A once-viable population of wild fish appeared to be nearing extinction. However, the severely reduced spawning escapements in the early 1980s produced substantial increases in spawning indices in recent years. From 1985 through 1988, redd counts in the Middle Fork of the Salmon River averaged 533 redds (350-972): a four-fold increase over the previous 6-year period. Wild stocks are clearly showing a high resiliency and potential for-recovery.

To some extent, downstream movements of wild juvenile spring and summer chinook salmon from natal areas occur during most of the year except mid-winter (Edmundson et al. 1968, Durkin et al. 1970, Krcma and Raleigh 1970, Bjornn 1971, Everest and Chapman 1972, Raymond 1979, Sekulich 1980, Lindsay et al. 1986). By far the largest downstream displacements occur in fall (0 age) and spring (l+ age). The magnitude of the fall migrations vary annually by stream and are influenced by prevailing environmental conditions and cover availability (Bjornn 1971, Raymond 1979, Sekulich 1980).

The fall migrations do not include all individuals of a particular stream population and are limited to movements into larger downstream tributaries probably for overwintering purposes. The spring movements are associated with smoltification and downstream migration to the sea. Regardless of location in fresh water, all yearling chinook salmon follow this life history pattern except for small numbers of precocious males (Bjornn 1971). If flows are adequate, these migrations culminate in all fish moving into the sea.

Before 1989, data on the timing of individual populations of wild fish as they passed through the lower Snake River on their way to the sea were limited. Raymond (1979) reported on the timing of wild smolts arriving at Ice Harbor Dam from 1964 through 1969. In that study, the composite population (mostly wild) arrived at the dam in early April and was usually present until mid-June. Peak movements varied annually, occurring as early as 20 April and as late as 20 May. In addition, the timing of a few individual populations were reported for only two years, 1966 and 1967. In 1966, Raymond found the earliest arriving fish were from Eagle Creek and the Imnaha River in Oregon, with a median passage date of 16 April for both streams. The latest arriving fish were from the Grande Ronde and Wallowa Rivers in Oregon with median passage on 3 June for both streams. In 1967, the earliest arriving fish were from the Lemhi River in Idaho, with a median passage date of 21 April, while fish from a nearby stream, the East Fork of the Salmon River, arrived last, with a median passage date of 19 May. Lindsay et al. (1986) found that wild smolts from the John Day River moved past John Day Dam on the Columbia River between mid-April and early June from 1979 through 1984. However, sample rates were extremely low at the dam, averaging 0 to 6 fish annually.

A detailed review of Raymond's unpublished field notes and data reveals that his results do not provide the scope or precision that is currently required for making decisions on behalf of these fish during their smolt migrations through the hydroelectric complex. For logistical reasons, the timing of populations from individual streams or reaches received little attention. Moreover, by today's standards, the methods used were primitive. Various forms of thermal marks including hot brands, alcohol and dry ice, and liquid nitrogen were used to mark very small parr in fall. Nearly all of these marks would have been virtually unnoticeable, much less identifiable, the following spring.

Marked fish were not representative of the entire population in any particular stream, as nearly all marking was on parr caught in box traps in fall, and marking of fish not migrating at this time was limited to a few individuals in a few streams. Only fish greater than 70-mm fork length were marked. This likely would have excluded from the study nearly half of the fish sampled in all streams. In many cases, release numbers were low.

In all cases, recoveries of marked fish at Ice Harbor Dam were low, usually in the range of O-10 fish.

Before 1992, fisheries management relied on branded hatchery fish, index counts at traps and dams, and flow patterns for information to guide decisions on dam operation and when to use water set aside for fish. In 1992, a more complete approach integrated PIT-tag information on passage of several wild spring and summer chinook salmon stocks through Lower Granite Dam. We are now moving closer to some specific goals of the Columbia River Basin Fish and Wildlife Program of the Pacific Northwest Electric Power Planning Council and Conservation Act (1980). Section 304(d) of this program states that: "The monitoring program will provide information on the migrational characteristics of the various stocks of salmon and steelhead within the Columbia Basin." Further, Section 201(b) urges conservation of genetic diversity. This will only occur if wild stocks are preserved. Clearly, the advent of PIT-tag technology has provided the opportunity to precisely track the smolt migrations of many stocks as they pass through the hydroelectric complex on their way to the ocean.

The National Marine Fisheries Service (NMFS) began a cooperative study with the U.S. Army Corps of Engineers (COE) in 1988 to PIT tag wild spring and summer chinook salmon parr for transportation research. This project continued through mid-1991, with outmigrating smolts monitored during spring and summer 1989-91 as they passed Lower Granite, Little Goose, and McNary Dams (Matthews et al. 1996, 1992; Achord et al. 1992).

Information from this study demonstrated that timing of various wild stocks through Lower Granite Dam differed among streams and also differed from patterns for hatchery-reared fish. Generally, the outmigrations of wild spring chinook salmon were later and more protracted than for their hatchery-reared counterparts, and they also exhibited variable outmigration timing patterns over the 3 years. Conversely, the outmigrations of wild summer chinook salmon were earlier and more protracted than for their hatchery counterparts.

This report provides information on the wild chinook salmon parr PIT tagging in 1991, and the subsequent monitoring of these fish as they migrated as smolts through Lower Granite, Little Goose, and McNary Dams during spring and summer 1992.

FISH COLLECTION AND TAGGING

From late July to October 1991, we collected and PIT tagged wild spring or summer chinook salmon parr in 13 streams in Idaho and 3 streams in Oregon (Fig. 1). Fish were collected and tagged from various reaches of each stream. Our primary objective was to collect parr with minimal impact to the fish. Areas of high parr concentration were located by snorkeling in advance of collection. Thus, we concentrated our collection and marking efforts in areas within each stream where parr abundance was highest.

Two primary methods were used to collect fish for tagging: electro-fishing and a seining method that we developed specifically for this application. This seining method was used

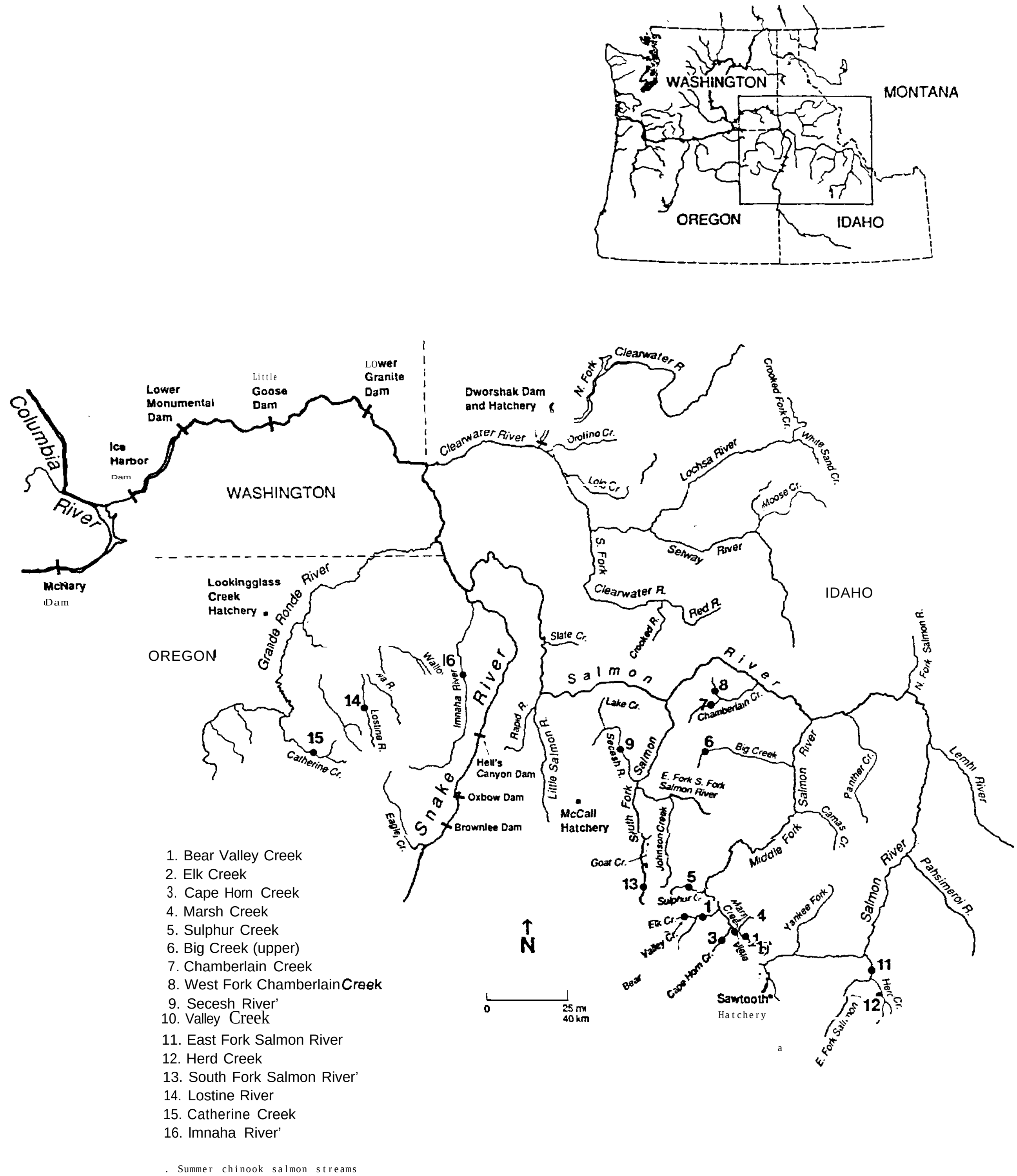

Figure 1.--Study area where wild spring and summer chinook salmon parr were PIT tagged during summer and fall 1991.

in three streams in Idaho and two streams in Oregon where fish densities were high. One seine was positioned securely across the lower end of a run or pool, while a second seine was placed across the river approximately lo-30 m upstream from the lower seine. The second seine was usually shorter and was moved quickly downstream, crowding fish toward the lower seine. As the lead line of the upstream seine crossed the lead line of the downstream seine, the lead line of the downstream seine was pulled up out of the water, trapping the fish. Captured fish were maintained in water by allowing the center of the seine to sag into the river. The fish were transferred in a water-tight sanctuary dip net (Matthews et al. 1986) to a 20-liter bucket and portaged to live cages to await tagging. Because densities of parr were low in most streams, electro-fishing was used in all the remaining streams. Electra-fishing units were the Smith-Root' Model 12. Techniques and settings used were those recommended by the manufacturer. Stunned fish were collected from the river with standard netted dip nets and placed in buckets for portaging to the live cages. To maintain minimum collection stress, all activities were nearly always terminated when water temperatures reached 16OC, or when any other occurrence suggested fish were being adversely affected.

The components and setup of the PIT-tagging station were the same as those described by Prentice et al. (1990b). Tagging was conducted using two portable PIT-tagging stations designed and

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[1] Reference to trade names does not imply endorsement by National Marine Fisheries Service, NOAA.

constructed by NMFS specifically for use beside streams in the field. Components of each station included an electronic balance, digitizer, tag detector, automatic tag injector, and printer. A multiport controller electronically directed the flow of information between the computer and other components of the station. A small 12-V battery powered the entire station except for the balance that was powered by a small external battery. The automatic tag injector used a push-rod system, which injected tags into the fish using high-pressure air. Each injector was loaded with clips containing approximately 150 PIT tags each.

To prepare the computer system to record marked fish, a program and a data disk were inserted into the computer, and the file name was designated. Header information at the beginning of each file included file name, creation date and time, tagger, species, run, rearing type, brood year, migratory year, tag site, raceway/transect, capture method, water temperatures at tagging and release, tagging method, agency, coordinator ID, comments, release date and time, release location and release river kilometer.

To initiate the marking process, a measured volume of concentrated MS-222 anesthetic was added to a plastic pan. The fish were dipped from a live cage with a sanctuary dip net and poured into the pan, bringing the anesthetic solution to 40-50 ppm immediately. After anesthesia, fish of other species and chinook salmon parr that were injured or less than 55 mm fork length were sorted and rejected (a few chinook salmon less than 55 mm were inadvertently tagged). Each remaining chinook salmon parr was injected with a PIT tag using the technique described by Prentice et al. (1990b). The tagged fish was then passed through the detector loop automatically recording the tag code on the computer. Next, the fish was placed on the electronic balance and the weight in grams was entered on the computer. Finally, the fish was laid on the digitizing board, where an electronic stylus was activated at the fork of the tail, and the length in millimeters was recorded on the computer. The digitizer assembly also included a grid or menu of individual comments or commands that could be activated by the stylus for any fish. Other comments could be added to the data sets of individual fish using the computer keyboard.

After tagging, fish were allowed to recover in a bucket of fresh water, transferred back to a live cage in the stream, and held for a minimum of 0.5 hours before release back into the stream. Tagged fish were released to the stream as close as possible to the location where they had been collected. Approximately 8-12% of the tagged fish from most streams were held in a live cage in the stream for 24 hours to evaluate tag loss and delayed mortality.

At the end of each day, data diskettes were taken to the main camp and the data transferred to a larger computer, where the files were edited. A gas-powered generator powered the larger computers and charged batteries in the small computers and tagging stations.

During 29 working days, from late July to October 1991, we collected 12,517 wild spring and summer chinook salmon parr in

Idaho and Oregon (Table 1 and Appendix Table 1). Of these, 12,086 were PIT tagged and released back into the streams. Numbers tagged and released per stream ranged from 209 in Cape Horn Creek to 1,107 in the Lostine River.

The fork length of wild fish tagged in Idaho ranged from 49 to 129 mm, with an average of 67 mm (Table 1 and Appendix Table 1). The weight ranged from 1.2 to 26.4 g with an average of 4.2 g. In Oregon streams, the fish were larger, with an average fork length of 83 mm (range 56 to 121 mm) and an average weight of 6.2 g (range 1.4 to 21.1 g).

Mortality associated with tagging procedures was low and tag loss was zero (Table 2 and Appendix Table 2). Collection mortality using electrofishing was 1.4 and 0.6% for Idaho and Oregon streams, respectively. The total observed mortality was 1.6 and 0.5% for Idaho and Oregon streams, respectively.

DETECTIONS AT DAMS

During spring and summer 1992, surviving chinook salmon PIT tagged for this study migrated downstream volitionally through the hydroelectric complex on the Snake and Columbia Rivers. Of the eight dams smolts passed, three were equipped with complete smolt collection and PIT-tag monitoring systems: Lower Granite and Little Goose Dams on the Snake River, and McNary Dam on the Columbia River (Fig. 1).

At the collection dams, all smolts guided away from the turbine intakes and into the juvenile bypass systems were electronically interrogated for PIT tags as they passed through

Table l.--Summary of the numbers collected, numbers PIT tagged and released, and average fork lengths and weights of wild spring and summer chinook salmon parr in Idaho and Oregon in summer and fall 1991.

Tagging location	Number collected	Number tagged and released	Average length of tagged fish (mm)	Average weight of tagged fish (g)
		Idaho		
Bear Valley Creek	1,069	1,042	68	4.3
Elk Creek	468	462	70	5.1
Sulphur Creek	213	210	67	4.1
Cape Horn Creek	211	209	63	3.6
Marsh Creek	1,005	981	66	3.9
Valley Creek	998	969	70	4.8
E. Fork Salmon River	698	669	76	5.9
Herd Creek	327	307	72	5.1
S:_Fork Salmon River	1,160	1,027	64	3.5
Big Creek (upper)	1,032	998	70	4.2
W. Fork Chamberlain Creek	1,085	1,057	64	3.3
Chamberlain Creek	339	338	67	3.4
Secesh River	1,060	1,012	64	3.6
Totals or averages	9,665	9,281	67	4.2
		Oregon		
Catherine Creek	967	940	83	7.3
Lostine River	1,122	1,107	86	7.6
Imnaha River	763	758	77	4.4
Totals or averages	2,852	2,805	83	6.2
Combined totals or averages	12,517	12,086	71	4.5

Table 2.--Mortality and tag loss for wild spring and summer chinook salmon parr collected and PIT tagged in Idaho and Oregon in summer and fall 1991.

Tagging location	Mortality (%) Collection	Tagging	24-hour	Overall	24-hour tag loss (%I
			Idaho		
Bear Valley Creek	0.7	0.0	1.7	0.8	0.0
Elk Creek	0.9	0.0		0.9	---
Sulphur Creek	0.9	0.0	0.0	0.9	0.0
Cape Horn Creek	0.5	0.0		0.5	---
Marsh Creek	0.9	0.0	0.0	0.9	0.0
Valley Creek	1.6	0.0	0.0	1.6	0.0
E. Fork Salmon River	3.7	0.0	0.0	3.7	0.0
Herd Creek	4.3	0.0	1.4	4.9	0.0
S. Fork Salmon River	2.2	0.0	1.4	2.4	0.0
Big Creek (upper)	1.8	0.2	1.7	2.4	0.0
W. Fork Chamberlain Creek	0.0	0.2	3.9	0.7	0.0
Chamberlain Creek	0.0	0.0	---	0.0	
Secesh River	1.2	0.0	0.5	1.3	0.0
Averages	1.4	0.0	1.2	1.6	0.0
			Oregon		
Catherine Creek	1.2	0.0	0.0	1.2	0.0
Lostine River	0.0	0.0	0.0	0.0	0.0
Imnaha River	---	_	---	0.1	---
Averages	0.6	0.0	0.0	0.5	0.0

the distribution flumes downstream from the outlet orifices of the fish and debris separators. The PIT-tag monitor systems were described by Prentice et al. (1990a). Dates and times to the nearest second were recorded on a computer as PIT-tagged fish passed through the numbered detector coils in the fish distribution flumes. ~11 detection data were transferred daily to the mainframe computer operated by the Pacific States karine Fisheries Commission in Portland, Oregon.

Detection totals and percentages were based exclusively on first-time detections of PIT tags at the three collector dams. That is, PIT tags detected at Little Goose and/or McNary Dams that were detected previously at Lower Granite Dam were subtracted from the totals for the second dam they encountered.

From 5 April to 27 July 1992, a total of 1,309 fish PIT tagged for this study were detected at the three dams (Table 3 and Appendix Tables 3-18). The combined detection rate at the three collector dams was 10.8%, with 6.4, 2.8, and 1.7% detected at Lower Granite, Little Goose, and McNary Dams, respectively. Detection rates at the dams varied by stream of origin (Fig. 2 and Table 3), ranging from 5.4% of the Secesh River fish in Idaho to 20.7% of the Imnaha River fish in Oregon. Using a two-sample Z-test, we found the overall detection rate for the 3 Oregon streams significantly higher than for the 13 Idaho streams ($P < 0.001$). Detection rates from Oregon streams averaged 16.5% (13.2-20.7%) while detection rates from Idaho streams averaged 9.1% (5.4-16.7%).

Table 3.--Summary of the detections of PIT-tagged wild spring and summer chinook salmon smolts at three dams in spring and summer 1992. See Table 1 for numbers released.

Stream	Lower Granite Dam N	Lower Granite Dam %	Little Goose Dam N	Little Goose Dam %	McNary Dam N	McNary Dam %	Total N	Total %
				Idaho				
Bear Valley Creek	69	6.6	25	2.4	8	0.8	102	9.8
Elk Creek	36	7.8	19	4.1	9	1.9	64	13.9
Sulphur Creek	24	11.4	9	4.3	2	1.0	35	16.7
Cape Horn Creek	19	9.1	3	1.4	5	2.4	27	12.9
Marsh Creek	67	6.8	19	1.9	11	1.1	97	9.9
Valley Creek	34	3.5	20	2.1	7	0.7	61	6.3
E. Fork Salmon River	33	4.9	16	2.4	15	2.2	64	9.6
Herd Creek	17	5.5	12	3.9	3	1.0	32	10.4
S. Fork Salmon River	81	7.9	32	3.1	11	1.1	124	12.1
Big Creek (upper)	57	5.7	20	2.0	11	1.1	88	8.8
W. Fork Chamberlain Creek	47	4.4	15	1.4	8	0.8	70	6.6
Chamberlain Creek	13	3.8	7	2.1	6	1.8	26	7.7
Secesh River	40	4.0	11	1.1	4	0.4	55	5.4
Totals or averages	537	5.8	208	2.2	100	1.1	845	9.1
				Oregon				
Catherine Creek	67	7.1	32	3.4	25	2.7	124	13.2
Lostine River	92	6.3	50	4.5	41	3.7	183	16.5
Imnaha River	73	9.6	47	6.2	37	4.9	157	20.7
Totals or averages	232	8.3	129	4.6	103	3.7	464	16.5
Combined totals or averages	**769**	6.4	337	2.8	203	1.7	1,309	10.8

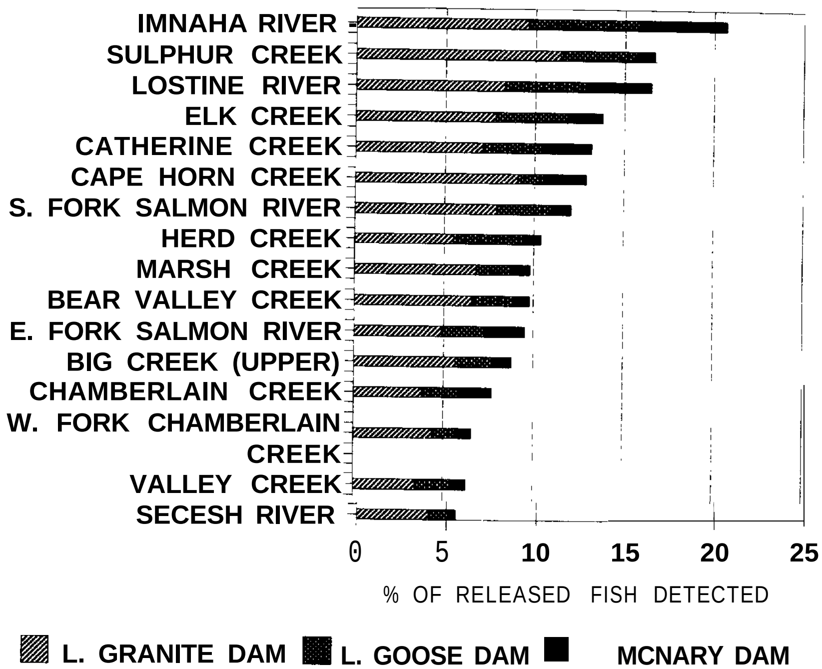


Figure 2.--Percent of PIT-tagged wild spring and summer chinook salmon detected at Lower Granite, Little Goose, and McNary Dams in spring and summer 1992. The South Fork Salmon, Secesh, and Imnaha Rivers are considered summer chinook salmon streams.

The proportions of total fish detected at the three dams were 58.7, 25.7, and 15.5% for Lower Granite, Little Goose, and McNary Dams, respectively. Using chi-square tests, we found significantly more fish were detected at Little Goose and McNary Dams for fish originating from Oregon streams than for fish originating from Idaho streams ($P < 0.001$).

To ascertain how water temperature may have affected chinook salmon parr at times of tagging and release and thereafter, we examined differences in detection rates for the various tag groups in the streams where fish were tagged and released under different water temperatures (Appendix Table 19). The detection rate of tag groups from all streams where water temperatures were 13OC or greater when tagging began was 10.3%. When tagging began at temperatures less than 13OC, detection rate was 11.0%. However, a two-sample Z-test showed no significant difference between these percentages.

For releases, the detection rate of fish from all streams where water temperatures were 14°C or greater at release time was 10.5%. When water temperatures were less than 14°C, the detection rate was 11.7%. These data showed a significant difference in detection rates for these two water temperature regimes ($P < 0.05$).

When we categorized tag groups by water temperatures at both tagging and release, we found that groups tagged and released under low-to-moderate temperatures (tagging range 7.5–14.5°C; release range 9.5–16°C) were detected at significantly higher rates than groups tagged and released under moderate-to-high temperatures (tagging range 10–17.5°C; release range 12.5–18.5°C) ($P < 0.001$). The tag groups that were encompassed by both of these categories were assigned to the category they most closely fit.

Tables 4 and 5 present information on detections of PIT-tagged fish at dams relative to fork length at time of release. The average fork length at release for fish from all Idaho streams was 2 mm less than that of Idaho fish detected at the dams. A one-sample t-test showed these lengths were significantly different ($P < 0.001$). For fish from Oregon streams, the average fork length at release was the same as that of Oregon fish detected at the dams, indicating the group arriving and guided at the dams was representative of the tagged population. When data from both states were combined, the average fork length at release was 3 mm less than the average fork length of fish detected at dams. These fork lengths were significantly different ($P < 0.001$).

We also found a significant difference in fork length at time of release between fish that outmigrated in April and May vs. fish that outmigrated in June ($P < 0.001$). When all streams were combined, fish outmigrating in June were 4-5 mm smaller on average when released than fish outmigrating in April and May. All streams but one were represented by detections at the dams after May. These data suggested that fish size may be an important factor influencing the dynamics of smoltification or location of overwintering.

Table 4.--Fork lengths at release of wild spring and summer chinook salmon tagged in 1991 and detected at dams in 1992.

	N	Average fork length (mm)	Standard deviation	Variance
Idaho streams				
released fish	9,290	67	6	44
detected fish	845	69	6	39
Oregon streams				
released fish	2,791	83	8	72
detected fish	464	83	8	65
All streams				
released fish	12,081[a]	71	9	91
detected fish	1,309	74	9	96

[a] This release number different than release number in Table 1 because lengths on 5 fish were not recorded.

Table 5.--Fork lengths at release of wild spring and summer chinook salmon detected at dams in April, May, and June 1992.

	N	Average fork length (mm)	Standard deviation	Variance
Idaho streams				
April	350	69	6	39
May	419	69	6	39
June	65	68	5	29
Oregon streams				
April	199	84	8	72
May	247	83	7	59
June	16	80	7	51
All streams				
April	549	75	10	102
May	666	74	9	94
June	81	70	7	56

OUTMIGRATION TIMING AT DAMS

Outmigration timing at dams was calculated by totaling detections in 3-day intervals and dividing by the total detected during the season. This method was applied to individual and combined streams.

Die1 timings at dams were based on detections of fish exiting the fish and debris separators. Timing was calculated by totaling detections of combined populations of wild fish for each of the 24 daily hours through various time periods of the outmigration and dividing by the total detected for the same time periods.

Spring Chinook Salmon

Timing of smolt migrations from individual streams was calculated at Lower Granite Dam; however, if the numbers detected from an individual stream were low, they were combined with those of an adjacent stream in the same drainage (Fig. 3).

Fish from Catherine Creek and Lostine River, both in northeast Oregon, and fish from East Fork of the Salmon River/Herd Creek in Idaho had the earliest and most compressed timing at Lower Granite Dam (Table 6). The middle 80% of the population passed the dam between mid-April and mid-May. Peak passage dates for fish from these streams occurred around mid-April and early May (Appendix Tables 9-10, 16-17).

Fish from the three major streams (Bear Valley/Elk Creeks, Sulphur Creek, and Marsh/Cape Horn Creeks) of the upper Middle

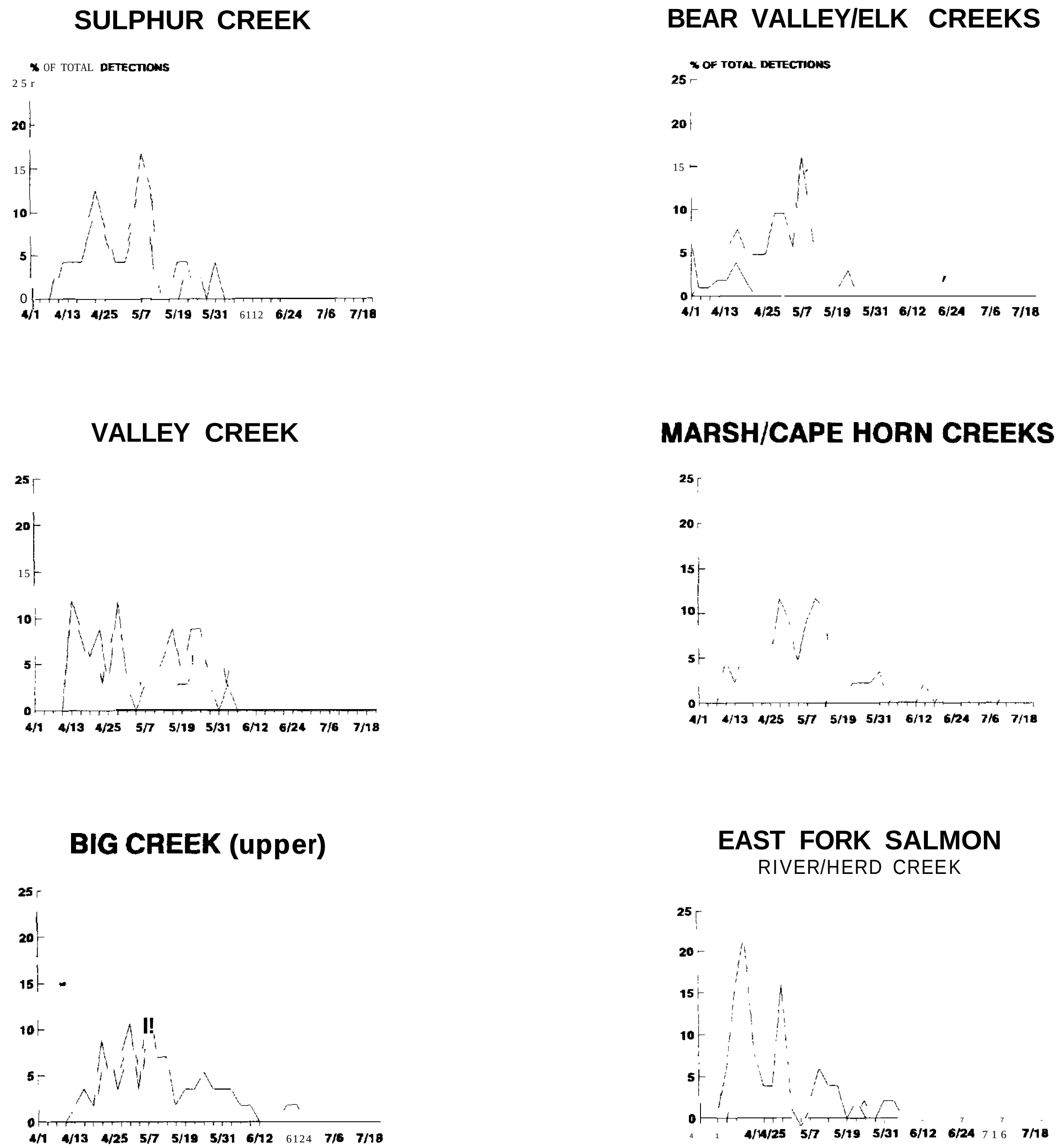
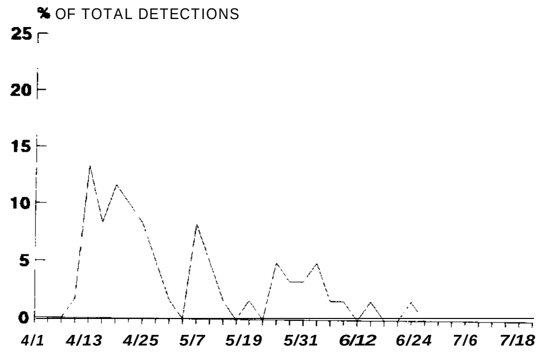
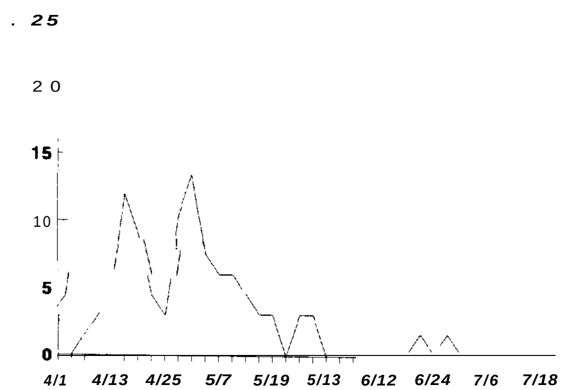


Figure 3.--The outmigration timing by individual streams of wild spring chinook salmon **smolts** at Lower Granite Dam in 1992.

WEST FORK CHAMBERLAIN /CHAMBERLAIN CREEKS



CATHERINE CREEK



LOSTINE RIVER

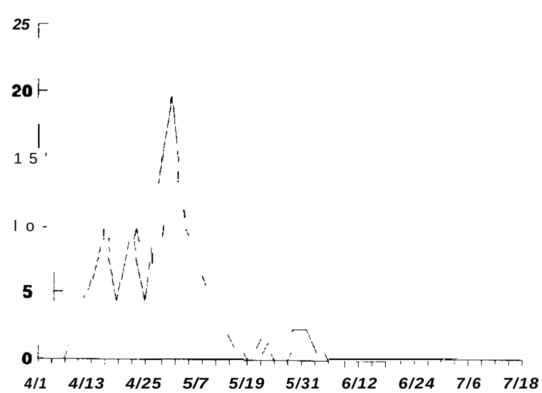


Figure 3. --Continued.

Table 6.--Dates of passage at Lower Granite Dam for PIT-tagged wild chinook salmon smolts from individual streams in spring and summer 1992.

Stream	Passage periods at Lower Granite Dam			
	10%	50%	90%	Range
		Wild spring chinook salmon		
Bear Valley/Elk Creeks	15 April	2 May	27 May	5 April-24 June
Sulphur Creek	16 April	3 May	23 May	10 April- 1 June
Marsh/Cape Horn Creeks	17 April	5 May	30 May	10 April-13 July
Valley Creek	15 April	30 April	27 May	13 April- 4 June
E. Fork Salmon River/Herd Creek	13 April	21 April	15 May	10 April- 3 June
Big Creek (upper)	22 April	8 May	3 June	15 April-26 June
W. Fork Chamberlain/Chamberlain Creeks	15 April	26 April	3 June	12 April-24 June
Catherine Creek	16 April	1 May	21 May	9 April-29 June
Lostine River	16 April	30 April	11 May	12 April- 2 June
		Wild summer chinook salmon		
S. Fork Salmon River	14 April.	29 April	27 May	7 April-27 July
Secesh River	13 April	29 April	4 June	5 April- 3 July
Imnaha River	10 April	21 April	3 May	6 April-21 May

Fork of the Salmon River drainage, and from Valley Creek in the upper Salmon River area had similar outmigration timing at Lower Granite Dam (Table 6). These fish showed a slightly later timing at the dam than the three aforementioned streams, with the middle 80% passing from mid-April to late May. Peak passage dates from these streams were scattered throughout this time period (Appendix Tables 3-8).

Fish from upper Big Creek, a tributary of the lower Middle Fork of the Salmon River, and West Fork Chamberlain/Chamberlain Creeks, tributary streams of the main Salmon River, had the most protracted timing at Lower Granite Dam of all spring chinook salmon streams (Table 6). The middle 80% of these fish passed the dam between mid-April and early June. Peak passage dates were scattered from mid-April to mid-May; however, peak passage dates for fish from West Fork Chamberlain/Chamberlain Creeks were earlier than for fish from upper Big Creek (Appendix Tables 12-14).

Timing of smolts from individual streams was not calculated for Little Goose and McNary Dams due to low numbers detected at these dams.

We combined all the wild spring chinook salmon stream detections at each of the three dams and compared the timing at each dam with the river flows during the same time periods (Fig. 4). Outmigrating wild spring chinook salmon were detected between early April and mid-July at Lower Granite Dam, with the middle 80% passing from mid-April to late May (Table 7). Peak passage dates occurred on 16 and 30 April. Peak fish passage

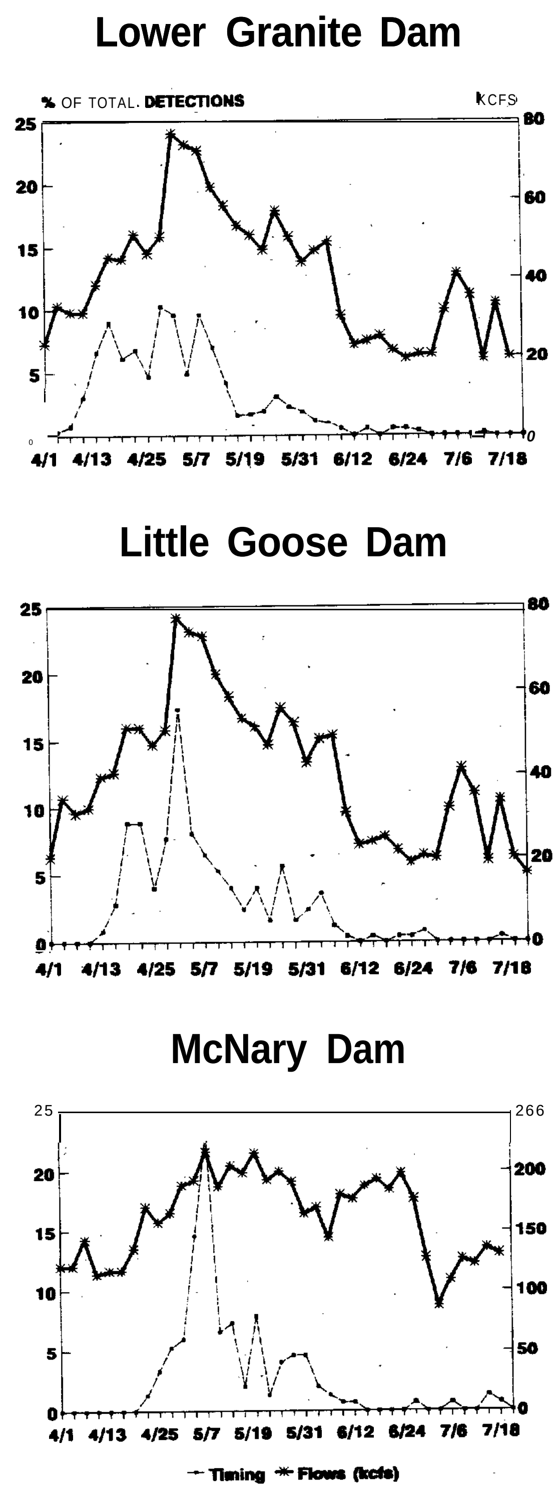


Figure 4.--The outmigration timing of wild spring chinook salmon at Lower Granite, Little Goose, and McNary Dams in , 1992, with associated river flow. Data represent detections from all streams combined by 3-day intervals and average river flows over the same time periods.

Table 7.--Dates of passage at Lower Granite, Little Goose, and McNary Dams for combined populations of PIT-tagged wild chinook salmon smolts in spring and summer 1992.

Dams	Passage periods at dams			
	10%	50%	90%	Range
		Wild spring chinook salmon		
Lower Granite Dam	15 April	1 May	27 May	5 April-13 July
Little Goose Dam	21 April	3 May	1 June	14 April-17 July
McNary Dam	1 May	9 May	1 June	23 April-18 July
		Wild summer chinook salmon		
Lower Granite Dam	11 April	25 April	26 May	5 April-27 July
Little Goose Dam	18 April	29 April	12 May	14 April-12 July
McNary Dam	29 April	May	31 May	18 April-16 July

dates did not coincide with peak flows at the dam: one-half of these fish passed the dam in April under low river flows ranging from 29 to 56 kcfs.

The middle 80% passage of wild spring chinook salmon occurred between late April and early June at Little Goose Dam, and during the entire month of May at McNary Dam. Peak passage periods for these fish coincided with peak flows at both dams. At Little Goose Dam 37% of the fish passed from 1 to 12 May under the highest river flows of the year, ranging from 56 to 79 kcfs. At McNary Dam, approximately 23% of the fish passed from 7 to 9 May, which coincided with the highest river flows of the year (202 to 229 kcfs).

Summer Chinook Salmon

Timing of smolt migrations from individual streams at Lower Granite Dam are depicted in Figure 5 and Table 6. Fish from the South Fork of the Salmon River and a tributary stream, the Secesh River, both showed similar early and protracted timing at Lower Granite Dam. The middle 80% of fish from the South Fork of the Salmon River passed between mid-April and late May. The peak passage times for these fish at the dam occurred in mid-April and early May (Appendix Table 11). The middle 80% of fish from the Secesh River showed the most protracted timing of all streams (including spring chinook salmon streams) at the dam, occurring from mid-April to early June. Peak passage for these fish occurred at the dam in mid-April (Appendix Table 15).

Wild summer chinook salmon smolts from the Imnaha River displayed earlier timing at Lower Granite Dam than all other

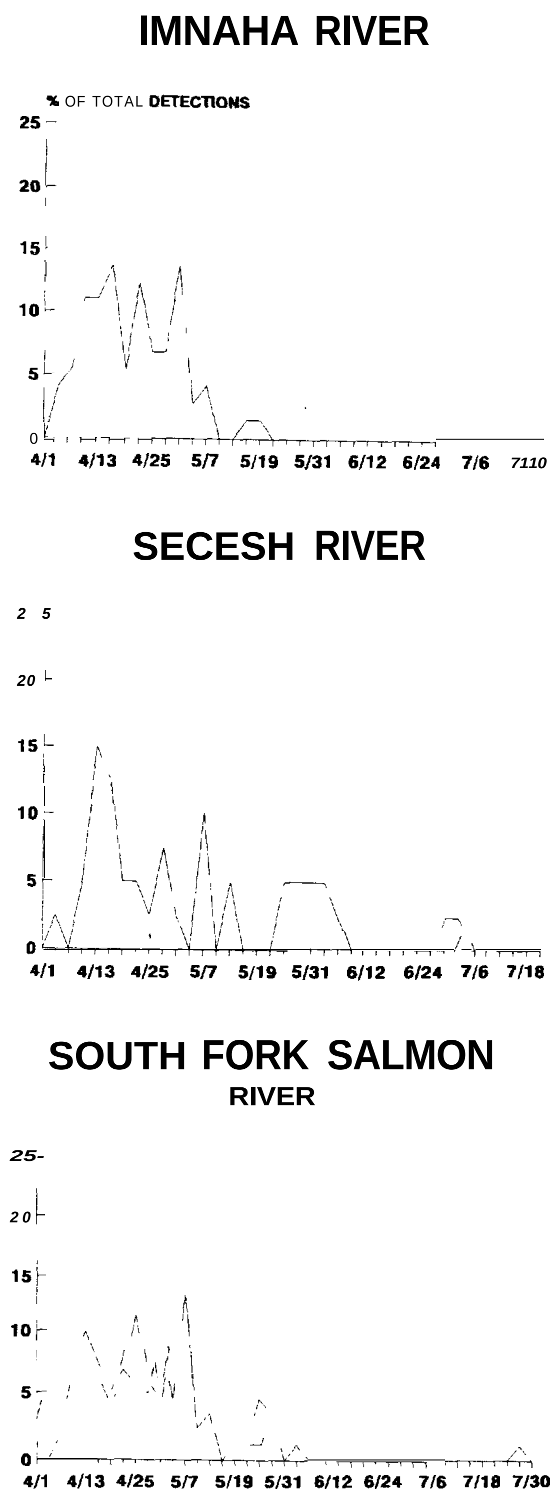


Figure 5.--The outmigration timing by individual streams of wild summer chinook salmon smolts at Lower Granite Dam in 1992.

streams. These fish were tagged as fall outmigrants at Box Trap 8-57. This release site was the closest of all streams to Lower Granite Dam. These fish showed the most compressed migration of all streams at the dam, with the middle 80% passage occurring from early April to early May. Peak passage for these fish occurred in mid-April and early May at the dam (Appendix Table 18).

Figure 6 shows the migration timing of smolts from combined populations at the three dams with associated river flows at these dams over the same time periods. At Lower Granite Dam, the overall timing of smolt migration for the combined wild population of summer chinook salmon was earlier than for that of spring chinook salmon (Table 7). The middle 80% of these fish passed from early April to late May at the dam. Peak passage for these fish occurred in mid-April, coincidental with low river flows of 39 to 50 kcfs. As was observed for wild spring chinook salmon, peak passage of wild summer chinook salmon did not coincide with peak flows at this dam. One-half of these fish passed the dam by late April, under low river flows of 29 to 56 kcfs.

The middle 80% of wild summer chinook salmon passed Little Goose and McNary Dams more rapidly than Lower Granite Dam: in only 25 days at Little Goose Dam, and 33 days at McNary Dam (Table 7). Unlike wild spring chinook salmon, peak passage of wild summer chinook salmon did not coincide with peak flows at these dams. Peak passage at Little Goose Dam occurred on 20 April under low river flow of 48 kcfs, and over 50% of these fish

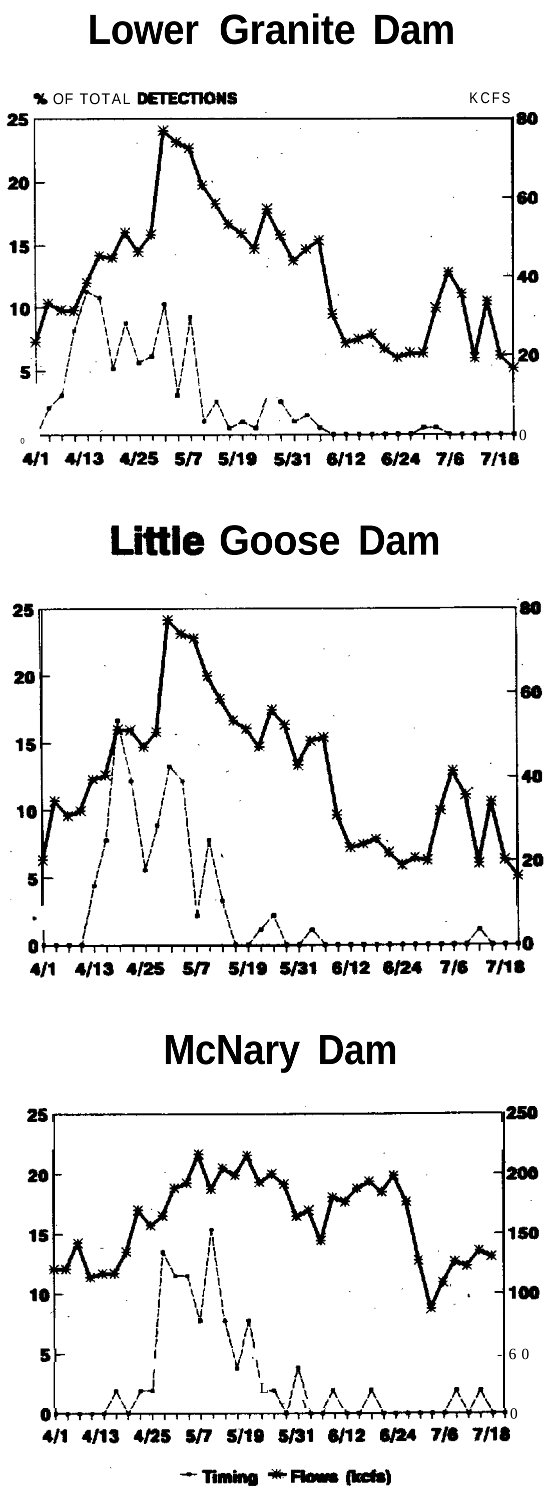


Figure 6.--The outmigration timing of wild summer chinook salmon at Lower Granite, Little Goose, and McNary Dams in 1992; with associated river flow. Data represent detections from all streams combined by 3-day intervals and average river flows over the same time periods.

passed in April under low flows, ranging from 28 to 56 kcfs. Passage peaked at McNary Dam in early and mid-May under low-to-moderate river flows of 166 to 201 kcfs. In fact, peak flow periods from 7 to 9 May and from 13 to 15 May coincided with a decrease in detections of wild summer chinook salmon at this dam.

Die1 Timing at Dams

Die1 passage timing in the bypass systems at the dams for the composite migrations of all wild chinook salmon PIT tagged for this study was calculated for fish exiting the fish and debris separators on an hourly basis as previously described (Fig. 7).

At Lower Granite Dam, slightly more wild smolts exited the separator from 0600 to 1800 h (daytime hours, 50.3%) than exited from 1800 to 0600 (mostly nighttime hours, 49.7%). When we examined passage in 6-hour periods, we found the lowest numbers exited the separator from 0600 to 1200 h, and the highest numbers exited from 1200 to 1800 h. However, the differences in percent passage during the four 6-hour periods were very low (23.7-26.6%), and not significantly different based on chi-square tests ($P > 0.05$). Peak passage times from the separator occurred at the two crepuscular times (morning and evening) and at mid-day. Die1 timing at this dam varied throughout the season, with more fish exiting the separator from 0600 to 1800 h in April (54.3%), and more fish exiting the separator from 1800 to 0600 h in May (53%).

At Little Goose Dam, more wild smolts exited the fish and debris separator from 0600 to 1800 h (54.3%) than exited from

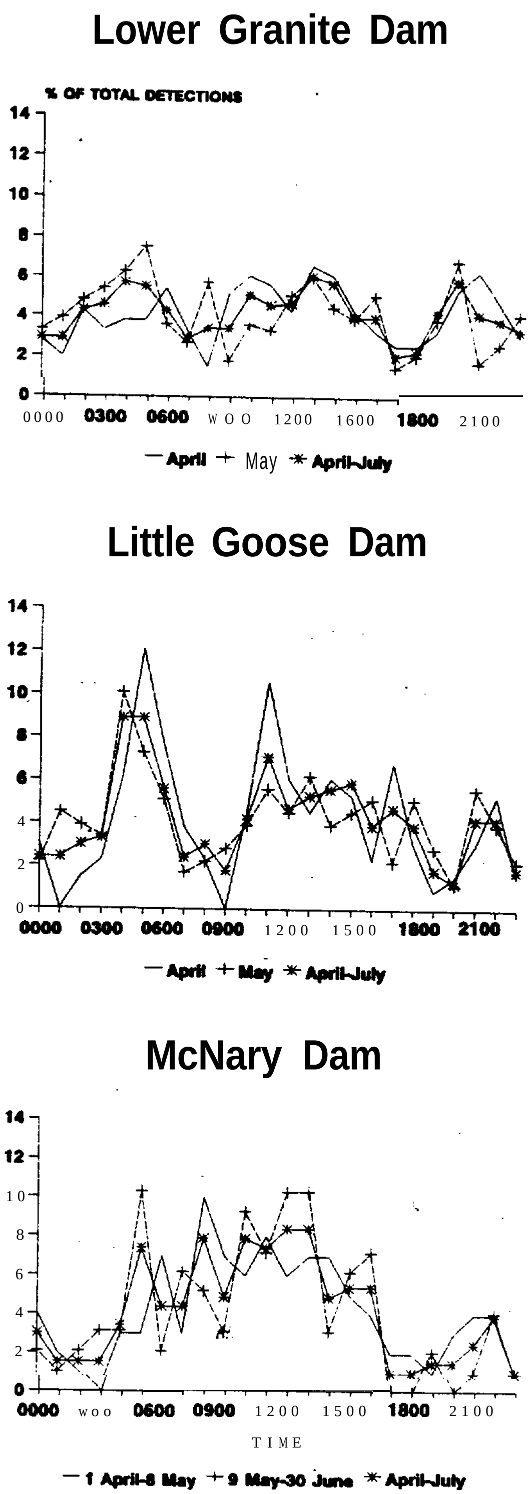


Figure 7.--Diel timing of smolt migrations of combined populations of wild chinook salmon at Lower Granite, Little Goose, and McNary Dams in 1992. Diel timing was calculated on an hourly basis for fish exiting the fish and debris separators during various time periods of the outmigration.'

1800 to 0600 h (45.7%), but the difference was not significant ($P > 0.05$). The lowest numbers exited the separator from 1800 to 0000 h, and the highest numbers exited from 1200 to 1800 h. The differences between passage rates during the four 6-hour periods were greater at Little Goose than at Lower Granite Dam (16-g-30.3%). However, passage from 1800 to 0000 h was the only time period significantly different from the other three ($P < 0.002$). The major peak passage time was from 0400 to 0600 h, with lesser peaks around mid-day and evening. As observed for Lower Granite Dam, more fish exited the separator from 0600 to 1800 h in April (59.8%), and more fish exited the separator from 1800 to 0600 h in May (52.2%).

At McNary Dam, significantly more wild smolts exited the fish and debris separator from 0600 to 1800 h (70.4%) than from 1800 to 0600 h (29.6%) ($P < 0.001$). The lowest numbers exited from 1800 to 0000 h, and the highest numbers exited from 0600 to 1200 h. The differences in passage rates during the four 6-hour periods were greater than at Lower Granite and Little Goose Dams (11.3-36.9%). There was no significant difference in passage rates between the two daytime periods or between the two nighttime periods ($P > 0.05$). However, as previously mentioned, there was a highly significant difference when the time periods were grouped by day and night. Peak passage time was from 1200 to 1400 h, with.a lesser peak in early morning. There was very little variation in die1 timing at this dam early and late in the season. The passage between 0600 and 1800 h was 72% from 1 April to 8 May, and 70.1% from 9 May to 30 June.

ENVIRONMENTAL INFORMATION

We discovered that many of the U.S. Geological Survey (USGS) stations used to collect flow information in the study area were no longer operational. FLOW information could only be collected from two sites on the Salmon River, one site on the South Fork of the Salmon River, one site on Catherine Creek, and one site on the Imnaha River (Appendix Table 20). No continuous water temperature information was available from any of these rivers.

DISCUSSION

Collection and tagging methods developed during previous studies in cooperation with the COE continued to be highly effective and successful during summer and fall 1991. Mortalities associated with collection and tagging were low and comparable to earlier results (Matthews et al. 1990, 1992; Achord et al. 1992).

Before 1992, we suspected that tagging and releasing wild fish at higher water temperatures may have affected their survival. Starting in summer 1992, we held fish overnight after tagging if the water temperature had reached 16°C. Results reported in a previous section support this procedural change. Another change in procedures will be implemented in summer 1993. Since we have not experienced a single lost tag during any 24-hour holding test in 3 years of tagging, it appears unnecessary to further stress fish by re-anesthetizing them to check for lost tags. We will record only mortality for fish held 24 hours, since this procedure does not require re-anesthesia. Tag loss will be determined by visually inspecting live cages for lost tags. Another change in tagging procedures was implemented in summer 1992. All fish were PIT tagged with hand injectors, using individual, disinfected syringes and needles.

Detections of wild fish at dams indicated that larger fish released the previous summer either survived better than smaller fish, and/or were guided into the bypass systems at the dams at a higher percentage than smaller fish. Small fish likely do not survive as well as larger fish whether tagged or not. However, we continue to detect many fish at the dams that were tagged at 55-60-mm fork length.

A very striking and consistent trend we have observed at the dams over the years is the relationship between migration timing and size at release. Wild fish outmigrating in April and May were significantly larger when released than fish outmigrating in June. This trend suggests the size of wild fish is an important factor related to either smolt development or other life history dynamics that affect outmigration timing.

In 1992, the average detection rate of wild fish was lower than in 1991, but higher than in 1989 or 1990 (Achord et al. 1992). We expected the detection rate for wild fish to be relatively high in 1992 because the winter of 1991-92 was the mildest of all study years. Overwinter mortality is only one factor that can influence detection rates at dams during the spring and summer after tagging.

In the previous 3 years, wild fish migrations were characterized by significant peaks after mid-May, coincidental with peak flows and turbidity brought on by either high country snow melt or heavy rains. In 1992, we experienced the lowest flows since 1977, with very low flows after mid-May. These flows were coincidental with low numbers of wild fish passing the dam after this time. However, it is also possible, due to the overall earlier timing of all fish in 1992, that fewer fish remained above Lower Granite Dam after mid-May.

Protracted arrival distributions and small sample sizes from different streams made it difficult to quantify small differences in outmigration timing at Lower Granite Dam. Consequently, the only statistically significant difference in timing between streams was between fish originating in the Imnaha River and upper Big Creek. Imnaha River fish arrived significantly earlier than upper Big Creek fish at the dam ($P < 0.05$). However, fish from all streams exhibited earlier timing at the dam than was observed during any of the previous 3 years (Matthews et al. 1990, 1992; Achord et al. 1992). As was observed in these previous studies, wild summer chinook salmon were the earliest arriving group at the dam.

We suspect the major causative factor for the earlier overall timing of all smolts in 1992 was the abnormally warm late winter and spring, which resulted in higher water temperatures than during any of the previous 3 years. We had also observed early timing in 1990, when the late winter and spring were warmer than normal. Both 1989 and 1991 were characterized by cold weather in late winter and early spring, resulting in below-normal water temperatures. Low water-temperatures probably retarded the outmigrations of wild fish in both of these years, even though river flows were near ,average in 1989. Raymond (1979) cited water temperature as one of the most important factors involved in triggering the downstream movements of hatchery-reared and wild chinook salmon smolts in spring.

Peak passage for combined smolt populations of wild spring and summer chinook salmon did not coincide well with periods of peak river flow (Appendix Table 21) at Lower Granite Dam. Substantially more of these fish passed the dam from 15 to 30 April under low river flows than passed from 1 to 16 May under higher river flows. We have observed passage of wild smolts at this dam to be highly variable over the past 4 years'and generally independent of river flows before mid-May. During the previous 3 years, peak passage after mid-May coincided well with periods of peak flow.

In 1992, peak detections of combined populations of wild spring and summer chinook salmon at Little Goose and McNary Dams coincided well with peak river flows (Appendix Tables 22 and 23). Whether the increased flow moved these groups of fish through the reservoirs or were simply coincidental with their arrival at the dams is unknown. However, since peak detections at these dams occurred almost simultaneously with increased flow, it seems likely that fish were near the dams and were moved through them rapidly by the increased flow. Nevertheless, it has become clear from examining chinook salmon smolt passage timing over the last

4 years, that flow is only one of several factors affecting passage timing. Other factors, such as water temperature, water turbidity, physiological development, variability in stock behavior, fish size, and other yet unknown conditions may equally affect wild smolt passage timing at dams.

Die1 timings of fish exiting the separators over the migration season were similar at Lower Granite and Little Goose Dams, but quite different at McNary Dam. We have no explanation for this phenomenon. A general observation at all three dams was that average hourly turbine discharge during daylight hours (0600-1800 h) was higher than average hourly turbine discharge during mostly nighttime hours (1800-0600 h). This coincided with higher passage of fish through the separators during daylight hours (0600-1800 h) at all three dams.

Pacific Northwest Laboratories of Battelle in Richland, Washington and NMFS have jointly proposed installing instream environmental monitors in selected streams in 1993. As this program extends to other streams, we will be able to examine a host of environmental factors which may affect chinook salmon parr survival and migratory behavior.

This year's study provided additional insight concerning the migrational behavior of different stocks of wild chinook salmon smolts in the Snake River Basin. The information gained from this work will be critical for making sound management decisions on behalf of these fish in the future.

ACKNOWLEDGMENTS

We thank Neil N. Paasch, Kenneth W. McIntyre, and others of our crew who participated in collecting and PIT tagging the thousands of fish involved in this study. We also thank Michael Lim and Lucy Bernard of the Fish Passage Center for furnishing valuable flow, water temperature, and turbine operation data, and the USGS for providing flow information for some study streams. Special thanks are also due for the cooperation by the Idaho Department of Fish and Game and the Oregon Department of Fish and Wildlife.

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Appendix Table 1. Summary of tagging dates, numbers collected, tagged, and released, maximum, minimum, and average lengths and weights of wild chinook salmon parr PIT tagged in various streams of Idaho and Oregon, late July - October 1991.

Stream	IDAHO														OREGON			
	BEAR VALLEY CREEK	ELK CREEK	SULPHUR CREEK	CAPE HORN CREEK	MARSH CREEK	VALLEY CREEK	EAST FORK SALMON R.	HERD CREEK	SOUTH FORK SALMON R.	BIG CREEK (upper)	WEST FORK CHAMBERLAIN CREEK	CHAMBERLAIN CREEK	SECESH RIVER	OVERALL TOTALS/ AVERAGES	CATHERINE CREEK	LOSTINE RIVER	IMNAHA RIVER	OVERALL TOTALS/ AVERAGES
Tagging dates	7/31 TO 8/3	8/4 TO 8/5	8/4 TO 8/5	8/6 TO 8/7	8/6 TO 8/8	8/9 TO 8/10	8/13 TO 8/15	a x 8/15	TO 8/17 TO 8/18	8/22 m 8/23	8/21 m 8/22	8/23	8/25 m 8/26	7/31 TO 8/26	9/4 TO 9/5	9/10	9/20, 10/11	9/4 TO 10/11
Total number collected	1069	468	213	211	1005	998	698	327	1160	1032	1095	339	1060	9665	967	1122	763	2852
Total number tagged	1044	462	210	209	931	969	669	312	1030	1004	1065	338	1013	9306	940	1107	759	2806
Total number tagged fish released	1042	462	210	209	931	969	669	307	1027	998	1057	338	1012	9231	940	1107	758	2805
Maximum length of tagged fish	123	85	79	37	88	13'1	96	90	93	86	129	109	94	129	111	121	106	121
Minimum length of tagged fish	53	57	52	52	50	52	a	55	51	56	49	56	52	49	62	bb	56	56
Average length of tagged fish	68	70	67	63	66	70	76	72	[illegible]	70	64	67	64	67	83	86	77	83
Maximum weight of tagged fish	26.4	8.4	8.4	8.5	10.7	14.4	11.0	9.5	8.0	7.7	12.3	15.3	7.3	26.4	15.3	21.1	11.4	21.1
Minimum weight of tagged fish	1.9	2.5	1.9	2.1	1.7	1.7	2.5	2.0	1.3	1.7	1.3	1.2	1.3	1.2	3.0	2.5	1.4	1.:
Average weight of tagged fish	4.0	5.1	4.4	3.6	3.9	4.8	5.9	5.1	3.5	4.2	3.3	3.4	3.6	4.2	7.3	7.5	4.4	6.2

Appendix Table 2.—Summary of collecting methods, collecting mortality, post-tagging mortality, 24-hour post-tagging mortality, tag loss, maximum, minimum, and average lengths and weights of tagging mortality of wild chinook salmon parr PIT tagged in various streams of Idaho and Oregon, late July - October 1991.

	IDAHO														OREGON			
Stream	BEAR VALLEY CREEK	ELK CREEK	SULPHUR CREEK	CAPE HORN CREEK	MARSH CREEK	VALLEY CREEK	EAST FORK SALMON R.	HERD CREEK	SOUTH FORK SALMON R	BIG CREEK	WEST FORK CHAMBERLAIN CREEK	CHAMBERLAIN CREEK (upper)	SECESH RIVER	OVERALL TOTALS/	CATHERINE CREEK AVERAGES	LOSTINE RIVER	IMNAHA RIVER	OVERALL TOTALS/ AVERAGES
Collecting method	SHOCK	SHOCK	SHOCK	SHOCK	SEINE/ SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SEINE	SEINE/ SHOCK	SHOCK		SEINE/ SHOCK	SEINE	BOX TRAP	
Number collection mortality	7	4	2	1	9	16	26	14	a	19	0	0	13	136	12	0	—	12
Percent collection mortality	0.7	c.9	G.9	0.5	0.9	1.6	3.7	4.3	2.2	1.8	0	0	1.2	1.4	1.2	0	—	0.6
Number (1/2-3h) post-tagging mortality	0	0	0	0	0	0	0	0	0	2	2	0	0	4	0	0	1	1
Percent (1/2-3h) post-tagging mortality	0	0	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0	0	3.1	0.0
Number held 24h post-tagging mortality	120	—	84	—	182	93	65	146	212	235	155	—	197	1490	138	132	—	320
Number 24h post-tagging mortality	2		0	—	0	0	0	2	3	4	6	—	1	18	0	0	—	0
Percent 24h post-tagging mortality	1.7	—	0	—	C	0	0	1.4	1.4	1.7	3.9	—	0.5	1.2	0	0	—	0.0
Number lost tags from 24h hold	0	—	0	—	0	0	0	0	0	0	0		0	0	0	0	—	0
Percent lost tags from 24h hold	0	—	0	—	0	0	0	0	0	0	0	—	0	0	0	0	0	0
Maximum length of post-tagging mortality	57	—	—	—	—	—	—	70	61	67	70		59	70			74	74
Minimum length of post-tagging mortality	64	—	—	—	—	—	—	65	55	57	54	—	59	54		—	74	74
Average length of post-tagging mortality	65	—	—	—	—	—	—	69	55	61	60		59	61			74	74
Maximum weight of post-tagging mortality	[illegible]	—	—	—	—	—			[illegible]	[illegible]	[illegible]		3.4	[illegible]		—	[illegible]	[illegible]
Minimum weight of post-tagging mortality	3.9	—	—	—	—	—			2.0	1.6	1.3	—	3.4	[illegible]	—		3.7	3.7
Average weight of post-tagging mortality	4.1	—	—	—	—	—			2.0	2.5	2.0	—	3.4	2.7		—	3.7	3.7

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Appendix **Table 3.--Detections of PIT-tagged** smolts **by date at three dams for wild spring chinook salmon from Bear Valley Creek, 1992.**

Tagging Site: Bear Valley Creek **Release Date: 07/31/91 to 08/03/91**
Release Site: Bear Valley Creek **Number Released: 1042**

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/07/92	2					
04/10/92	1					
04/11/92	1					
04/14/92	2					
04/15/92	1					
04/16/92	2					
04/17/92	2					
04/18/92	3	1				
04/19/92	2	1				
04/20/92	1	1				
04/21/92	2					
04/24/92	2	1				
04/25/92	1					
04/26/92	1	1				
04/27/92		2				
04/29/92	2	1		1		
04/30/92	4					
05/01/92	4					
05/02/92	2	1				
05/03/92	2					
05/04/92	1					
05/05/92	1	2				
05/07/92	7	1				
05/08/92	4			2		
05/09/92	2					
05/10/92	2			1		
05/11/92	2					
05/12/92	3	3				
05/13/92		1				
05/14/92	1	1				
05/17/92	1					
05/18/92		1		1		
05/19/92				1		
05/20/92		1				
05/21/92	1					
05/24/92	1	2				
05/25/92	1					
05/26/92	1					
05/27/92	1					
05/28/92				1		
05/29/92		1				
05/30/92				1		
06/04/92		1				
06/07/92	1					
06/09/92	1	1				
06/24/92	1					
06/20/92		1				
Totals	69	25	0	8		0

Appendix Table 4.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Elk Creek, 1992.

Tagging Site: Elk Creek
Release Site: Elk Creek

Release Date: 08/03/91 to 08/05/91
Number Released: 462

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 & m	McNary Prev. detect. at 2 dams
04/05/92	1					
04/06/92	1					
04/09/92	1					
04/11/92	1					
04/15/92	3					
04/14/92		1				
04/16/92	1	1				
04/23/92	1	1				
04/24/92	2					
04/25/92	2	1				
04/27/92	1					
04/20/92	1					
04/30/92	3	1		1		
05/01/92	1	1				
05/02/92	1	1				
05/04/92	1					
05/05/92	1	1		1		
05/05/92	2	1		1		
05/08/92	1			3		
05/09/92	3	2		1		
05/10/92	1		1			
05/12/92		3				
05/19/92		1				
05/21/92	1					
05/22/92	1					
05/23/92		1				
05/27/92	1	1				
05/20/92	2					
06/04/92		1				
06/00/92	2					
06/11/92				1		
06/12/92				1		
07/17/92		1				
Totals	36	19		9	0	0

Appendix Table 5.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Sulphur Creek, 1992.

Tagging Site: Sulphur Creek
Release Site: Sulphur Creek

Release Date: 08/04/91 to 08/05/91
Number Released: 210

Detection date	Lower Granite first detection	Lit .e Goose		McNary		
		First detect.	Prev.detect. at 1 dam	First detect,	Prev. detect. at l & m	Prev. detect. at 2 dams
04/10/92	1					
04/15/92	1	1				
04/16/92	1					
04/19/92	1					
04/20/92	1	1				
04/22/92	1					
04/23/92	2					
04/25/92	1					
04/27/92	1					
04/30/92	1					
05/02/92		1				
05/03/92	1	1				
05/04/92	1					
05/06/92	1					
05/07/92	1					
05/08/92	2					
05/09/92	1					
05/10/92	1			1		
05/11/92	1	1				
05/12/92	1					
05/13/92		1				
05/17/92		1				
05/20/92				1		
05/23/92	1					
05/26/92	1					
05/30/92		1				
06/01/92	1					
06/03/92		1				
Totals	24	9	0	2	0	0

Appendix Table 6.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Cape Horn Creek, 1992.

Tagging Site: Cape Horn Creek — Release Date: 08/06/91 to 08/07/91
Release Site: Cape Horn Creek — Number Released: 209

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/10/92	1					
04/12/92	1					
04/14/92	1					
04/20/92	1					
04/21/92	1					
04/23/92	1					
04/27/92	1	1				
04/28/92	1					
04/29/92	1					
05/01/92		1				
05/03/92	1					
05/04/92	1					
05/05/92	1			1		
05/07/92				1		
05/11/92	1					
05/12/92	2					
05/19/92				2		
05/20/92				1		
05/24/92	1					
05/25/92		1				
05/27/92	1					
05/30/92	1					
06/01/92	1					
Totals	19			5	0	0

Appendix Table 7.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Marsh Creek, 1992.

Tagging Site: Marsh Creek
Release Site: Marsh Creek

Release Date: 09/06/91 to OS/OS/91
Number-Released: 981

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/10/92	1					
04/11/92	1					
O4/15/92	1					
04/16/92	2					
04/17/92	2					
04/18/92	1					
04/19/92	1	1				
04/21/92	1					
04/23/92	1					
04/24/92	1					
04/25/92	1					
04/26/92	1					
04/27/92	1					
04/20/92	2					
04/29/92	3					
04/30/92	3	3		1		
05/01/92	1	1				
05/02/92	5	1				
05/03/92	1	3				
05/04/92	1	1				
O5/O5/92	1					
05/07/92	3					
05/08/92	4			2		
05/09/92	- 1	1				
05/10/92	3	1				
05/11/92	3					
05/12/92	1	2				
05/13/92	1		1	2		
05/14/92	4	1				
05/15/92	4	2				
05/10/92				1		
05/19/92		1				
05/20/92				1		
05/22/92	1'					
05/26/92	1					
05/27/92				1		
05/20/92	1					
06/01/92	1	l		1		
06/02/92	1					
06/04/92				1		
O5/O5/92	- 1					
06/15/92	1					
06/16/92	1					
06/23/92	1					
06/29/92	1					
07/08/92				1		
07/13/92	1					
Totals	67	19	1	11	0	0

Appendix Table 8.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Valley Creek, 1992.

Tagging Site: Valley Creek
Release Site: Valley Creek

Release Date: 08/09/91 to 08/11/91
Number Released: 969

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/13/92	2					
04/15/92	2					
04/16/92	3					
04/19/92	1	2				
04/20/92		1				
04/21/92	1					
04/22/92	3					
04/23/92		3				
04/24/92		3				
04/25/92	1					
04/28/92	1					
04/29/92	1					
04/30/92	2	1		1		
05/01/92	1					
05/02/92		1				
05/03/92		1				
05/04/92		1		1		
05/07/92	1	1		2		
05/08/92		1		1		
05/10/92	1					
05/14/92	2					
05/17/92	1					
05/18/92	2	1				
05/20/92	1	1		1		
05/23/92	1					
05/24/92	2					
05/26/92		1				
05/27/92	3					
05/29/92	1					
06/01/92		1				
06/03/92		1				
06/04/92	1					
07/04/92				1		
Totals	34	20		7	0	0.

Appendix Table 9.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from East Fork Salmon River, 1992.

Tagging Site: E.F. Salmon River **Release Date: 08/14/91 to 08/15/91**
Release Site: E.F. Salmon River **Number Released: 669**

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. Detect. at 1 dam	McNary Prev. Detect. at 2 dams
04/10/92	2					
04/12/92	1					
04/13/92	1					
04/14/92	3					
04/15/92	1					
04/16/92	3					
04/17/92	2					
04/18/92	- 1					
04/20/92	1	2				
04/21/92	2	2				
04/23/92	1	1				
04/24/92		1.		1		
04/25/92	1	1				
04/26/92		1		1		
04/27/92	1					
04/28/92	1					
04/29/92	1	1				
04/30/92	1	1		1		
05/01/92				2		
05/02/92	1	3		1		
05/04/92				1		
05/05/92				2		
05/06/92		1				
05/07/92				3		
05/08/92		1				
05/09/92	1					
05/11/92	1					
05/12/92	1			1		
05/13/92				1		
05/14/92	1					
05/15/92	1					
05/16/92	1			1		
05/20/92		1				
05/23/92	1					
05/31/92	1					
06/03/92	1					
Totals	33	. 16	0	15	0	0

Appendix Table 10.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Herd Creek, 1992.

Tagging Site: Herd Creek
Release Site: Herd Creek

Release Date: 08/14/91 to 08/15/91
Number Released: 307

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 & m	McNary Prev. detect. at 2dams
04/13/92	1					
04/14/92	1					
04/15/92	1					
04/16/92	3					
04/17/92	2					
04/20/92	1					
04/22/92		1				
04/23/92	1					
04/26/92		1				
04/28/92	2	1				
04/29/92	1	3				
04/30/92	2					
05/01/92				1		
05/02/92		3				
05/03/92		1				
05/06/92		1				
05/10/92	1					
05/11/92				1		
05/13/92		1		1		
05/10/92	1					
Totals	17	12		3	0	0

Appendix Table ll.-- Detections of PIT-tagged siuolts by date at three dams for wild summer chinook salmon from South Fork Salmon River, 1992.

Tagging Site: S.F. Salmon River Release Date: 08/17/91 to 08/18/91
Release Site: S-F-. Salmon River Number Released: 1027

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at l dam	McNary First detect.	McNary Prev. detect. at l & m	McNary Prev. detect. at 2 dams
04/07/92	1					
04/08/92	1					
04/10/92	3					
04/11/92	1					
04/12/92	2					
04/14/92	3					
04/15/92	5					
04/16/92	4	2				
04/17/92	2	1				
04/10/92		1				
04/19/92	1	1				
04/20/92		3				
04/21/92	3					
04/22/92	1					
04/23/92	4	1				
04/24/92	1	1				
04/25/92		2				
04/26/92	4	1				
04/27/92	1					
04/28/92	2			1		
04/29/92	2	2		1		
05/01/92	1			1		
05/02/92	6	1				
05/03/92	2	3				
05/04/92	1	3				
05/05/92	3	1				
05/06/92				1		
05/07/92	4			2		
05/08/92	6					
05/09/92	1					
05/10/92	1	3	1			
05/12/92	1 .	2				
05/13/92	1					
05/14/92	2			1		
05/15/92		2				
05/16/92				1		
05/21/92	1					
05/22/92		1				
05/24/92	1				1	
05/27/92	4			1		
05/20/92	1					
05/30/92	2					
06/04/92		1				
O5/O5/92	1					
07/11/92				1		
07/16/92				1		
07/27/92	1					
Totals	81	32	1	11		0

Appendix Table 12.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from West Fork Chamberlain Creek, 1992.

Tagging Site: W.F. Chamberlain Creek   Release Date: 08/21/91 to 08/22/91
Release Site: W.F. Chamberlain Creek   Number Released: 1057

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/12/92	1					
04/14/92	3					
04/15/92	4					
04/16/92	1					
04/17/92	4					
04/19/92	3	1				
04/20/92	2					
04/21/92	1	2				
04/22/92	2	1				
04/23/92	3	1		1		
04/24/92	1	3				
04/25/92	1					
04/26/92	1					
04/27/92	1					
04/28/92	2					
04/29/92		2				
04/30/92	1	1		1		
05/01/92	1					
05/02/92		1		1		
05/06/92				1		
05/07/92	1			1		
05/08/92	1			1		
05/09/92	2					
05/10/92	1					
05/11/92				1		
05/12/92	2					
05/13/92	1					
05/14/92				1		
05/19/92		1				
05/27/92	1					
05/28/92	1					
05/29/92	1					
06/01/92		1				
06/02/92	1					
06/03/92	1					
06/04/92		1				
06/07/92	1					
06/11/92	1					
Totals	47	15	0	8	0	0

Appendix Table 13.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Chamberlain Creek, 1992.

Tagging Site: Chamberlain Creek Release Date: 08/23/91
Release Site: Chamberlain Creek Number Released: 338

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/14/92	1					
04/21/92	1					
04/26/92	2					
05/05/92				2		
05/06/92				2		
05/07/92	1					
05/19/92		1				
05/21/92	1					
05/25/92	1					
05/26/92	1					
05/27/92		1				
05/31/92	1			1		
06/02/92		1				
06/03/92	2	1				
06/07/92		1				
06/16/92	1					
06/23/92		1				
06/24/92	1					
06/25/92		1				
07/18/92				1		
Totals	13	7	0	6	0	0

Appendix Table 14.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Big Creek (upper), 1992.

Tagging Site: Big Creek (upper) Release Date: 08/22/91 to 08/23/91
Release Site: Big Creek (upper) Number Released: 998

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/15/92	1					
04/16/92	1					
04/17/92	1					
04/21/92	1					
04/22/92	2					
04/23/92	1					
04/24/92	2	1				
04/25/92	1					
04/26/92	1	1				
04/28/92	1					
04/29/92	2					
04/30/92	1					
05/01/92	4					
05/02/92	2	2				
05/03/92		1				
05/04/92		2				
05/05/92	2					
05/06/92		2				
05/07/92	4			1		
05/08/92	2			2		
05/09/92	2			1		
05/10/92	3					
05/12/92	1					
05/13/92	1	2		1		
05/14/92	1					
05/15/92	2					
05/16/92	1	1				
05/17/92		1				
05/19/92				1		
05/20/92	1					
05/21/92	1					
05/22/92	1					
05/23/92	1					
05/27/92	3	2				
05/28/92	1					
05/29/92	1					
05/30/92				1		
06/01/92	2	1				
06/02/92		1		1		
06/03/92	1					
06/04/92		1		1		
06/05/92	1					
06/07/92		1				
06/08/92	1	1				
06/09/92	1					
06/23/92	1					
06/26/92	1					
06/28/92				1		
07/16/92				1		
Totals	57	20	0	11	0	0

Appendix Table 15.-- Detections of PIT-tagged smolts by date at three dams for wild summer chinook salmon from Secesh River, 1992.

Tagging Site: Secesh River | Release Date: 08/25/91 to 08/26/91
Release Site: Secesh River | Number Released: 1012

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/05/92	1					
04/11/92	1					
04/12/92	1					
04/13/92	2					
04/14/92	2					
04/15/92	2					
04/16/92	4					
04/18/92	1	1		1		
04/19/92	2					
04/20/92		1				
04/22/92	1	2				
04/23/92		1				
04/24/92	1					
04/27/92	1					
04/28/92				1		
04/29/92	1					
04/30/92	2					
05/01/92		1				
05/02/92	1					
05/04/92		1				
05/06/92				1		
05/07/92	2					
05/08/92	1					
05/09/92	1	1				
05/10/92				1		
05/13/92	1					
05/14/92	1	1				
05/25/92		1				
05/26/92	1	1				
05/27/92	1					
05/29/92	1					
05/30/92	1					
05/31/92	1					
06/01/92	1					
06/04/92	1					
06/05/92	1					
06/08/92	1					
07/01/92	1					
07/03/92	1					
Totals	40	11	0	4	0	0

Appendix Table 16.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Catherine Creek, 1992.

Tagging Site: Catherine Creek Release Date: 09/04/91 to 09/05/91
Release Site: Catherine Creek Number Releashd: 940

Detection date	Lower Granite first detection	Lit .e Goose First detect.	Prev. detect. at l&m	McNary First detect.	McNary Prev. detect. at l & m	2 dams
04/09/92	1					
04/10/92	2					
04/15/92	3					
04/16/92	6	2				
04/17/92	1					
04/18/92	1	2				
04/19/92		1				
04/20/92	1					
04/21/92	5	1				
04/22/92	1					
04/23/92	1					
04/24/92	1	2				
04/26/92	2	1		1		
04/28/92	1			1		
04/29/92	1					
04/30/92	5	2				
05/01/92	2	2		1		
05/02/92	6	3				
05/03/92	1	2				
05/04/92	2			1		
05/05/92	1	2				
05/06/92	2	1		3		
05/07/92	2			1		
05/08/92	1			1		
05/09/92	1	1		3		
05/10/92	2			1		
05/11/92	1					
05/12/92	1	1		1		
05/13/92	1			1		
05/14/92	2					
05/15/92				1		
05/16/92	1					
05/17/92		1				
05/18/92	1					
05/19/92		2				
05/20/92		1		1		
05/21/92	2			2		
05/25/92		1				
05/27/92	2	2		2		
05/28/92	1					
05/29/92	1					
05/30/92				1		
05/31/92				1		
06/02/92				1		
06/06/92				1		
06/15/92		1				
06/23/92	1					
06/28/92		1				
06/29/92	1					
Totals	67	32	0	25	0	0

Appendix Table 17.-- Detections of PIT-tagged smolts by date at three dams for wild spring chinook salmon from Lostine River, 1992.

Tagging Site: Lostine River
Release Site: Lostine River

Release Date: 09/10/91 to 09/11/91
Number Released: 1107

Detection date	Lower Granite first detection	Little Goose First detect.	Little Goose Prev. detect. at 1 dam	McNary First detect.	McNary Prev. detect. at 1 dam	McNary Prev. detect. at 2 dams
04/12/92	3					
04/13/92	1					
04/14/92	3					
04/15/92	1					
04/16/92	5					
04/17/92	3					
04/10/92	1	1				
04/19/92	2	2				
04/20/92		2				
04/21/92	2	2				
04/22/92	3	1				
04/23/92	2					
04/24/92	4	2				
04/25/92	1					
04/26/92	1			2		
04/27/92	2			1		
04/28/92	1					
04/29/92	7					
04/30/92	4	2		1		
05/01/92	7	2		1		
05/02/92	7	6		1		
05/03/92	4	4		1		
05/04/92	5	2		1		
05/05/92	1	3				
05/06/92	3			5		
05/07/92	2	4		1		
05/08/92	1	3		6		
05/09/92	4	1	1	2		
05/10/92	1			1		
05/11/92	2	1		2		
05/12/92	1	1				
05/13/92				2		
05/14/92	1	1		l		
05/15/92	1					
05/19/92				1		
05/20/92	1					
05/21/92	1					
05/22/92				1		
05/24/92		1		1		
05/26/92		3				
05/27/92		2		3		
05/20/92	2	1		1		
05/29/92		1				
05/30/92				2		
05/31/92				1		
06/01/92	1			1		
06/02/92	1					
06/03/92				1		
06/04/92		2				
06/00/92				1		
Totals	92	50	1	41	0	0

Appendix Table 18.-- Detections of PIT-tagged smolts by date at three dams for wild summer chinook salmon from Imnaha River, 1992.

Tagging Site: Imnaha River | Release Date: 09/20/91 & 10/11/91
Release Site: Imnaha River | Number Released: 758

Detection date	Lover Granite first detection	Little Goose		McNary		
		First detect.	Prev. detect. at 1 dam	First detect.	Prev. detect. at 1 dam	Prev. detect. at 2 dams
04/06/92	3					
04/08/92	4					
04/10/92	4					
04/11/92	4					
04/13/92	2					
04/14/92	5	3				
04/15/92	1	1				
04/16/92	6	1				
04/17/92	3					
04/18/92	1	1				
04/19/92	2	3				
04/20/92	1	4				
04/21/92	1	3				
04/22/92	5	4				
04/23/92	2	1				
04/24/92	2	1		1		
04/25/92	1	1				
04/26/92	1	1		1		
04/27/92	3					
04/20/92	2					
04/29/92	2	2		3		
04/30/92	1	4		1		
05/01/92	2	5		4		
05/02/92	5	2		1		
05/03/92	3					
05/04/92	1			2		
05/05/92	1	2		2		
05/06/92		4				
05/07/92	2	1		1		
05/08/92	1			1		
05/10/92				3		
05/11/92		2		3		
05/12/92				1		
05/13/92				1		
05/14/92				1		
05/15/92				1		
05/16/92	1					
05/17/92				1		
05/19/92				1		
05/20/92				3		
05/21/92	1					
05/23/92				1		
05/31/92				1		
06/01/92				1		
06/11/92				1		
06/19/92				1		
07/12/92		1				
Totals	73	47	0	37	0	0

Appendix Table 19.--A summary of the tagging dates, rtart tagging times and temperature8 (°C), releaoe dates, release timer and temperatures, methods of capture, distance (in kilometer81 from the stream's mouth to the release point, number released, number detected, and percent detected for each tag group at the three collector damo during the spring and rummer of 1992.

Stream name	Tag group	Tag date	Start tag time	Releaoe date	Rel. time	Start tag temp (°C)	Rel. temp (°C)	Capture method	Rel. km. from mouth	No. rel.	No. det.	% det.
BIG	DMM91234.BCl	08/22/91	05:26	08/22/91	13:15	9.0	13.5	SHOCK	51	82	19	23.2
CREEK	DMM91234.BC2	08/22/91	06:09	08/22/91	13:15	9.0	13.5	SHOCK	52	101	22	21.8
(upper)	DMM91234.BC3	08/22/91	07:09	08/23/91	12:lO	9.0	12.5	SHOCK		232	10	4.2
									52		7	3.1
	DMM91234.BC[illegible].	0B/22/91	10:07	09/22/91	13:[illegible]	1[illegible].5	14.0	SHOCK	53	2[illegible]	19	8.8
	DMM91235.BCl	08/23/91	08:08	08/23/91	12:30	10.0	13.0	SHOCK	54	139	11	8.0
BEAR	KMC91215.BVl	08/03/91	04:54	08/03/91	13:53	11.0	16.0	SHOCK	17	98	14	14.3
VALLEY	SA91212.BVl	08/01/91	07:05	08/02/91	11:45	13.0	16.0	SHOCK	9	118	12	10.2
CREEK	SA91212.BVZ	07/31/91	OS:36	07/31/91	12:30	14.0	16.5	SHOCK	11	38	1	17.2
	SA91213.BVl	08/01/91	05:50	08/01/91	13:30	14.0	19.0	SHOCK	12	342	20	2.6
	SA91213.BV2	08/01/91	06:29	08/01/91	13:30	14.5	19.0	SHOCK	13			8.0
	SA91213.BVl	08/02/91	05:22	08/02/91	12:00	12.5	16.0	SHOCK	14	112	10	17.9
	SA9l2l4.BV2	08/02/91	07:09	08/02/91	14:00	13.5	19.0	SHOCK	15	218	25	11.5
CHAMBERLAIN	SA91235.CBl	08/23/91	05:46	08/23/91	11:00	10.5	12.5	SEINE	27	296	22	7.7
CREEK	SA91235.CB2	08/23/91	08:14	08/23/91	11:00	11.5	12.5'	SHOCK	27	52	4	7.7
CATHERINE	SA91247.CC2	09/04/91	10:13	09/05/91	08:00	13.5	9.5	SEINE	42	138	25	18.1
CREEK	SA91247.CC3	09/04/91	ll:OS	09/04/91	14:40	15.5	19.5	SEINE	42	265	35	13.2
									44	85	7	8.2
	SA9124cc4	09/04/91	[illegible]	09/04/91	15:00	[illegible]	[illegible]	[illegible]	49	345	44	12.8
	SA91248.CC2	09/05/91	11:45	09/05/91	14:30	14.0	15.0	SEINE	47	107	13	12.1
CAPE HORN	DMM91219.CHl	08/07/91	07:09	08/07/91	13:00	8.0	13.0	SHOCK	3	25	4	16.0
CREEK	DMM91219.CH2	08/07/91	07:46	08/07/91	13:30	8.0	13.0	SHOCK	4	27	4	14.9
												8.5
	DMM91219.CH3	08/07/91	l0:45	08/07/91	13:30	13.0	13..0	SHOCK	1	62	4	6.5
	SA9121S.Ml	08/06/91	12:12	08/06/91	15:45	1[illegible]	13.5	SHOCK	2	36	10	27.8
									1			
ELK	KMC91215.ECl	08/03/91	05:57	08/03/91	14:15	11.0	16.0	SHOCK	4	286	39	13.6
CREBK	KMC91217.ECl	08/05/91	09:45	08/05/91	14:17	14.5	16.0	SHOCK		126	17	13.5
	KMC91217.EC2	08/05/91	l0:35	08/05/91	14:26	16.0	16.0	SHOCK	6	50	8	16.0

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Appendix Table 19.-- (continued)

Stream name	Tag group	Tag date	Start tag time	Release date	Rel. time	Start tag temp (°C)	Rel. temp (°C)	Capture method	Rel. km. from mouth	No. rel.	No. det.	% det.
EAST FORK SALMON RIVER	SA91225.EFl	08/13/91	l0:31	08/14/91	12:30	14.5	14.0	SHOCK	7	65	6	9.2
	SA91226.EFl	08/14/91	06:06	08/14/91	12:15	11.0	14.0	SHOCK	13	154	14	9.1
	SA91226.EF2	08/14/91	10:ll	08/14/91	13:00	14.0	15.0	SHOCK	14	38	4	10.5
	SA91227.EFl	08/15/91	06:30	08/15/91	11:15	11.0	12.0	SHOCK	16	111	10	9.0
	SA91227.EF2	08/15/91	08:20	08/15/91	13:30	12.0	14.5	SHOCK	17	301	30	9.9
HERD CREEK	SA91225.HCl	08/13/91	07:49	08/14/91	12:15	11.0	14.0	SHOCK		144	16	'11.1
	SA91226.HCl	08/14/91	09:20	08/14/91	13:00	13.0	15.0	SHOCK	3	25	1	4.0
	SA91227.HCl	08/15/91	07:39	08/15/91	14:00	11.5	15.0	SHOCK	4	65	7	10.8
	SA91227.HC2	08/15/91	l0:46	08/15/91	14:00	13.5	15.0	SHOCK	5	73	8	11.0
IMNAHA RIVER	SA91263.IRl	09/20/91	08:OO	09/20/91	11:40	12.5	15.0	BTRAP	37	274	38	13.9
	SA91284.IRl	10/11/91	l0:24	10/11/91	14:00	11.0	14.0	BTRAP	37	484	119	24.6
LOSTINE RIVER	CRP91253.LR1	09/10/91	12:16	09/11/91	14:00	11.5	14.0	SEINE	20	182	40	22.0
	CRP91253.LR2	09/10/91	13:23	09/10/91	16:15	12.5	13.0	SEINE	20	385	59	15.3
	DMM91253.LRl	09/10/91	12:19	09/10/91	16:15	11.5	13.0	SEINE	21	540	84	15.6
MARSH CREEK	DMM91219.MC1	08/07/91	08:07	08/07/91	13:15	8.5	13.5	SHOCK	12	168	20	11.9
	DMM91219.MC2	08/07/91	10:00	09/07/91	13:15	11.5	13.5	SHOCK	13	117	8	6.8
	SA91218.MCl	08/06/91	07:02	08/07/91	13:15	9.0	13.5	SHOCK	10	97	13	13.4
	SA91218.MC2	08/06/91	08:ll	08/07/91	13:15	10.0	13.5	SEINE	12	85	18	21.2
	SA91218.MC3	09/06/91	09:43	08/06/91	15:00	11.5	15.5	SEINE	12	105	12	11.4
	SA91220.MCl	08/08/91	06:54	08/08/91	13:OO	7.5	13.5	SHOCK	14	149	11	7.4
	SA91220.MC2	09/09/91	08:18	05/08/91	13:00	10.0	13.5	SHOCK	15	260	15	5.8
SOUTH FORK SALMON RIVER	SA91229.SFl	08/17/91	06:40	08/18/91	11:30	12.5	14.0	SHOCK	111	209	22	10.5
	SA91229.SF2	08/17/91	08:04	08/17/91	13:30	12.0	16.0	SHOCK	112	675	82	12.1
	SA91230.SFl	08/18/91	08:40	08/18/91	12:00	13.0	14.5	SHOCK	113	143	20	14.0
SULPHUR CREEK	SA91216.SUl	08/04/91	07:29	08/05/91	09:45	10.5	10.5	SHOCK	'5	84	12	14.3
	SA91216.8112	08/04/91	11:25	08/04/91	14:30	12.5	13.0	SHOCK	6	59	9	15.3
	SA91217.SUl	08/05/91	07:12	08/O5/91	13:45	10.5	13.0	SHOCK	7	67	14	20.9
SECESH RIVER	DMM91238.SEl	08/26/91	07:lO	08/26/91	15:00	9.5	16.0	SHOCK	29	165	3	1.8
	DMM91238.SE2	08/26/91	08:51	08/26/91	15:00	10.5	16.0	'SHOCK	30	179	16	8.9
	DMM9123S.SE3	08/26/91	11:14	08/26/91	15:00	14.5	16.0	SHOCK		57	2	3.5
	KMC91237.SEl	08/25/91	07:Ol	08/26/91	15:00	11.5	16.0	SHOCK	26	196	11	5.6
	KMC91237.SE2	08/25/91	OS:56	O8/25/91	14:15	'12.5	14.5	SHOCK	27	415	23	5.5
VALLEY CREEK	SA91221.VCl	08/09/91	06:44	08/09/91	13:30	10.5	18.0	SHOCK	3	424	23	5.4
									11		10	10.8
	SA91222.VC2	08/10/91	07:01	08/11/91	12:30	10.5	18.0	SHOCK	12	452	28	6.2

Appendix Table 19.-- (continued)

Stream name	Tag group	Tag date	Start TAG time	Release date	Rel. time	Start TAG temp (°C)	Rel. temp (°C)	Capture method	Rel. km. from mouth	No. rel.	No. det.	% det.
WEST FORK	GSH91233,WC1	08/21/91	08:33	08/22/91	10:15	11.0	12.5	SEINE	1	149	7	4.5
CHAMBERLAIN	GSH91233.WC2	08/21/91	09:21	08/21/91	13:30	13.0	16.0	SEINE	1	665	45	6.8
CREEK	GSH91234.WC1	08/22/91	06:43	08/22/91	10:15	10.0	12.5	SEINE	1	243	18	7.4

Appendix Table 20.--Monthly flow information in cubic feet per second (cfs) for the Salmon River at Salmon and Whitebird, Idaho, the South Fork of the Salmon River at Krassel Ranger Station, Catherine Creek near Union, Oregon, and the Imnaha River at Imnaha, Oregon--September 1991 to June 1992. These data were provided by the U.S. Geological Survey and is cited as provisional data subject to revision.

Station Number 13302500--Salmon River at Salmon, Idaho

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
wean Flow	767	959	1,239	1,035	980	916	1,030	1,393	2,249	1,469
Max. Flow	912	1,220	1,500	1,240	1,170	1,050	1,110	1,690	2,890	1,940
win. Flow	610	843	1,030	870	786	805	952	1,120	1,860	1,170

Station Number 13317000--salmon River at White Bird. Idaho

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
mean Flow	3,480	3,555	4,557	3,795	3,431	3,864	5,615	11,150	19,470	8,905
max. Plow	4,040	4,180	5,620	5,210	3,800	5,060	6,670	20,400	26,700	13,400
Min. Flow	3,190	3,370	3,560	2,680	2,680	2,940	4,690	6,110	14,500	6,590

Station Number 13310700--South Fork Salmon River at Krassel Ranger Station

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
mean flow	93	-----	-----	166	136	148	258	766	-----	-----
wax. flow	129	-----	-----	286	226	238	309'	1,490	-----	-----
win. flow	82	-----	-----	96	98	111	202	331	-----	-----

Station number 13320000--Catherine Creek near union. oregon

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
wean flow	---	25	50	76	98	74	144	175	171	69
wax. flow	---	42	134	223	291	204	195	244	271	102
will. flow	---	22	26	30	20	31	105	118	106	41

Station number 13292000--Imnaha River at Imnaha. 0regon

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
mean flow	---	115	145	135	128	209	371	451	571	361
max. flow	---	143	209	165	164	363	440	615	734	524
win. Flw	---	106	97	88	84	131	319	357	446	275

Appendix Table 21.--Daily detections of PIT-tagged wild spring and summer chinook salmon smolts at Lower Granite Dam during spring and summer 1992, with associated river discharges (kcfs) and water temperatures (°F) at the dam.

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
04/01/92	17.9	50	0	0.0
04/02/92	21.3	50	0	0.0
04/03/92	31.0	51	0	0.0
04/04/92	31.3	51	0	0.0
04/05/92	33.2	50	2	0.3
04/06/92	35.0	51	4	0.5
04/07/92	29.0	51	3	0.4
04/08/92	33.2	52	5	0.7
04/09/92	32.4	52	2	0.3
04/10/92	30.9	52	15	2.0
04/11/92	29.4	52	9	1.2
04/12/92	34.0	50	9	1.2
04/13/92	35.4	49	9	1.2
04/14/92	41.3	49	24	3.1
04/15/92	38.8	49	27	3.5
04/16/92	49.5	49	42	5.5
04/17/92	40.4	50	22	2.9
04/18/92	46.5	50	9	1.2
04/19/92	47.3	52	15	2.0
04/20/92	44.7	52	9	1.2
04/21/92	42.7	53	21	2.7
04/22/92	48.6	53	19	2.5
04/23/92	55.7	53	20	2.6
04/24/92	50.0	53	17	2.2
04/25/92	48.0	53	11	1.4
04/26/92	47.4	50	14	1.8
04/27/92	44.2	50	13	1.7
04/28/92	47.5	51	17	2.2
04/29/92	49.1	51	24	3.1
04/30/92	55.9	53	30	3.9
05/01/92	77.1	55	24	3.1
05/02/92	79.7	56	36	4.7
05/03/92	74.1	56	15	2.0
05/04/92	73.9	53	14	1.8
05/05/92	73.8	54	12	1.6
05/06/92	74.7	54	8	1.0
05/07/92	68.9	54	30	3.9

Appendix Table 21.--(continued)

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
05/08/92	74.1	55	24	3.1
05/09/92	74.9	56	19	2.5
05/10/92	69.8	55	17	2.2
05/11/92	65.8	55	11	1.4
05/12/92	54.2	54	14	1.8
05/13/92	47.7	53	6	0.8
05/14/92	63.1	53	15	2.0
05/15/92	65.0	53	8	1.0
05/16/92	66.6	53	4	0.5
05/17/92	50.2	54	2	0.3
05/18/92	43.8	54	4	0.5
05/19/92	45.4	54	0	0.0
05/20/92	49.3	56	3	0.4
05/21/92	58.8	56	9	1.2
05/22/92	51.6	57	3	0.4
05/23/92	45.1	57	4	0.5
05/24/92	45.2	56	5	0.7
05/25/92	45.3	58	2	0.3
05/26/92	56.1	57	5	0.7
05/27/92	70.5	58	17	2.2
05/28/92	56.7	59	9	1.2
05/29/92	50.7	59	5	0.7
05/30/92	44.7	59	4	0.5
05/31/92	42.9	59	3	0.4
06/01/92	40.9	59	7	0.9
06/02/92	48.9	60	3	0.4
06/03/92	51.1	60	5	0.7
06/04/92	42.4	61	2	0.3
06/05/92	48.1	60	3	0.4
06/06/92	50.1	60	0	0.0
06/07/92	50.0	61	2	0.3
06/08/92	48.2	59	5	0.7
06/09/92	41.9	58	2	0.3
06/10/92	25.4	58	0	0.0
06/11/92	24.2	59	1	0.1
06/12/92	22.7	59	0	0.0
06/13/92	22.3	59	0	0.0
06/14/92	24.4	59	0	0.0
06/15/92	24.9	59	1	0.1
06/16/92	23.3	60	2	0.3
06/17/92	24.0	61	0	0.0
06/18/92	27.1	60	0	0.0
06/19/92	25.4	60	0	0.0

Appendix Table 21.--(continued)

Date	Daily average flow, (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
06/20/92	23.4	60	0	0.0
06/21/92	23.5	62	0	0.0
06/22/92	21.2	70	0	0.0
06/23/92	20.4	61	3	0.4
06/24/92	20.1	61	2	0.3
06/25/92	19.6	62	0	0.0
06/26/92	18.8	62	1	0.1
06/27/92	19.5	63	0	0.0
06/28/92	19.8	63	0	0.0
06/29/92	22.4	65	2	0.3
06/30/92	18.9	66	0	0.0
07/01/92	20.5	71	1	0.1
07/02/92	22.4	68	0	0.0
07/03/92	24.1	68	1	0.1
07/04/92	33.9	68	0	0.0
07/05/92	38.1	68	0	0.0
07/06/92	40.5	68	0	0.0
07/07/92	40.6	67	0	0.0
07/08/92	42.4	65	0	0.0
07/09/92	41.0	64	0	0.0
07/10/92	37.1	64	0	0.0
07/11/92	28.8	63	0	0.0
07/12/92	22.8	62	0	0.0
07/13/92	16.9	62	1	0.1
07/14/92	18.3	63	0	0.0
07/15/92	30.8	63	0	0.0
07/16/92	34.9	63	0	0.0
07/17/92	35.3	63	0	0.0
07/18/92	28.1	63	0	0.0
07/19/92	17.0	64	0	0.0
07/2.0/92	14.5	62	0	0.0
07/21/92	16.1	62	0	0.0
07/22/92	16.4	59	0	0.0
07/23/92	17.7	59	0	0.0
07/24/92	18.2	60	0	0.0
07/25/92	17.3	61	0	0.0
07/26/92	16.2	61	0	0.0
07/27/92	15.3	66	1	0.1
07/28/92	15.0	66	0	0.0
07/29/92	14.2	66	0	0.0

Appendix Table 22. --Daily detections of PIT-tagged wild spring and summer chinook salmon smolts at Little Goose Dam during spring and summer 1992, with associated river discharges (kcfs) and water temperatures (°F) at the dam.

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
04/01/92	13.6		0	0.0
04/02/92	21.3	--	0	0.0
04/03/92	26.1	--	0	0.0
04/04/92	30.5	--	0	0.0
04/05/92	38.1	--	0	0.0
04/06/92	34.3	--	0	0.0
04/07/92	24.7	--	0	0.0
04/08/92	32.7	--	0	0.0
04/09/92	35.1	--	0	0.0
04/10/92	35.7	--	0	0.0
04/11/92	27.6	--	0	0.0
04/12/92	32.4	--	0	0.0
04/13/92	37.9	--	0	0.0
04/14/92	37.6	--	4	1.2
04/15/92	42.9	53	2	0.6
04/16/92	36.7	52	6	1.8
04/17/92	38.9	52	1	0.3
04/18/92	45.9	52	7	2.1
04/19/92	46.8	52	12	3.6
04/20/92	48.3	52	15	4.5
04/21/92	58.7	52	10	3.0
04/22/92	48.4	52	9	2.7
04/23/92	55.9	52	9	2.7
04/24/92	49.3	52	15	4.5
04/25/92	49.6	52	5	1.5
04/26/92	47.2	52	7	2.1
04/27/92	44.8	53	3	0.9
04/28/92	47.2	54	1	0.3
04/29/92	49.5	55	11	3.3
04/30/92	55.5	52	15	4.5
05/01/92	78.6	53	13	3.9
05/02/92	79.4	52	26	7.7
05/03/92	74.1	52	16	4.7
05/04/92	72.8	52	10	3.0
05/05/92	74.8	54	11	3.3
05/06/92	74.5	55	10	3.0
05/07/92	70.4	55	7	2.1

Appendix Table 22.--(continued)

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
05/08/92	73.7	55	5	1.5
05/09/92	74.8	54	6	1.8
05/10/92	70.5	54	4	1.2
05/11/92	65.6	55	4	1.2
05/12/92	56.0	55	12	3.6
05/13/92	47.7	56	5	1.5
05/14/92	63.1	56	4	1.2
05/15/92	65.1	56	4	1.2
05/16/92	67.4	5.6	1	0.3
05/17/92	49.7	57	3	0.9
05/18/92	43.2	57	2	0.6
05/19/92	45.3	56	6	1.8
05/20/92	50.1	56	4	1.2
05/21/92	59.2	56	0	0.0
05/22/92	51.6	56	1	0.3
05/23/92	46.0	57	1	0.3
05/24/92	44.0	58	3	0.9
05/25/92	45.5	60	3	0.9
05/26/92	53.3	58	5	1.5
05/27/92	69.1	60	8	2.4
05/28/92	62.0	59	1	0.3
05/29/92	50.1	59	2	0.6
05/30/92	45.1	59	1	0.3
05/31/92	43.5	59	0	0.0
06/01/92	41.1	62	4	1.2
06/02/92	43.9	62	2	0.6
06/03/92	55.0	62	3	0.9
06/04/92	42.5	62	7	2.1
06/05/92	48.2	62	0	0.0
06/06/92	51.0	62	0	0.0
06/07/92	49.6	62	2	0.6
06/08/92	47.7	62	1	0.3
06/09/92	43.7	63	1	0.3
06/10/92	25.1	63	0	0.0
06/11/92	23.8	63	0	0.0
06/12/92	23.2	64	0	0.0
06/13/92	21.8	62	0	0.0
06/14/92	24.7	62	0	0.0
06/15/92	24.5	62	1	0.3
06/16/92	23.2	62	0	0.0
06/17/92	24.4	61	0	0.0
06/18/92	27.2	62	0	0.0
06/19/92	24.7	62	0	0.0

Appendix Table 22.-- (continued)

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
06/20/92	23.6	62	0	0.0
06/21/92	23.6	63	0	0.0
06/22/92	22.3	64	0	0.0
06/23/92	19.7	64	1	0.3
06/24/92	20.1	64	0	0.0
06/25/92	18.4	64	1	0.3
06/26/92	18.8	65	0	0.0
06/27/92	19.6	65	0	0.0
06/28/92	19.6	65	2	0.6
06/29/92	23.0	66	0	0.0
06/30/92	19.1	66	0	0.0
07/01/92	18.9	68	0	0.0
07/02/92	22.4	70	0	0.0
07/03/92	24.7	68	0	0.0
07/04/92	34.1	70	0	0.0
07/05/92	36.9	70	0	0.0
07/06/92	41.5	70	0	0.0
07/07/92	40.5	71	0	0.0
07/08/92	42.3	71	0	0.0
07/09/92	40.6	71	0	0.0
07/10/92	37.7	71	0	0.0
07/11/92	28.6	71	0	0.0
07/12/92	23.8	70	1	0.3
07/13/92	16.8	70	0	0.0
07/14/92	17.6	68	0	0.0
07/15/92	31.1	69	0	0.0
07/16/92	35.0	69	0	0.0
07/17/92	35.9	68	1	0.3
07/18/92	28.5	68	0	0.0
07/19/92	17.2	67	0	0.0
07/20/92	15.2	68	0	0.0

Appendix Table 23.--Daily detections of PIT-tagged wild spring and summer chinook salmon smolts at McNary Dam during spring and summer 1992, with associated river discharges (kcfs) and water temperatures (°F) at the dam.

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
04/01/92	114.3	48	0	0.0
04/02/92	115.5	48	0	0.0
04/03/92	132.2	48	0	0.0
04/04/92	110.8	48	0	0.0
04/05/92	108.8	48	0	0.0
04/06/92	143.1	48	0	0.0
04/07/92	137.5	49	0	0.0
04/08/92	140.3	49	0	0.0
04/09/92	151.0	49	0	0.0
04/10/92	146.1	49	0	0.0
04/11/92	113.1	49	0	0.0
04/12/92	82.6	49	0	0.0
04/13/92	111.8	49	0	0.0
04/14/92	111.5	49	0	0.0
04/15/92	128.3	49	0	0.0
04/16/92	118.0	49	0	0.0
04/17/92	109.2	49	0	0.0
04/18/92	123.6	49	1	0.5
04/19/92	130.0	51	0	0.0
04/20/92	128.1	51	0	0.0
04/21/92	146.9	52	0	0.0
04/22/92	160.3	52	0	0.0
04/23/92	181.3	53	1	0.5
04/24/92	170.2	53	2	1.0
04/25/92	173.0	53	0	0.0
04/26/92	158.9	52	5	2.5
04/27/92	141.1	52	1	0.5
04/28/92	147.7	52	3	1.5
04/29/92	164.8	53	5	2.5
04/30/92	184.2	53	7	3.4
05/01/92	190.2	52	11	5.4
05/02/92	188.9	52	3	1.5
05/03/92	186.1	54	1	0.5
05/04/92	187.0	54	6	3.0
05/05/92	184.0	54	8	3.9
05/06/92	206.4	54	14	6.9
05/07/92	218.1	55	13	6.4

Appendix Table 23.-- (continued)

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
05/08/92	229.1	56	19	9.4
05/09/92	201.9	55	7	3.4
05/10/92	166.4	55	8	3.9
05/11/92	194.8	55	7	3.4
05/12/92	200.8	55	3	1.5
05/13/92	208.2	55	9	4.4
05/14/92	200.4	55	4	2.0
05/15/92	206.7	55	2	1.0
05/16/92	211.3	55	2	1.0
05/17/92	193.5	55	1	0.5
05/18/92	191.9	55	2	1.0
05/19/92	202.7	55	6	3.0
05/20/92	216.2	55	8	3.9
05/21/92	226.9	57	2	1.0
05/22/92	234.4	57	1	0.5
05/23/92	182.7	57	1	0.5
05/24/92	162.5	57	1	0.5
05/25/92	174.5	57	0	0.0
05/26/92	207.9	57	0	0.0
05/27/92	218.9	57	7	3.4
05/28/92	202.6	60	2	1.0
05/29/92	199.2	60	0	0.0
05/30/92	173.9	60	5	2.5
05/31/92	166.3	60	4	2.0
06/01/92	169.4	60	3	1.5
06/02/92	159.3	60	2	1.0
06/03/92	173.5	60	1	0.5
06/04/92	172.8	60	2	1.0
06/05/92	162.8	62	0	0.0
06/06/92	145.9	62	1	0.5
06/07/92	140.6	62	0	0.0
06/08/92	145.9	62	1	0.5
06/09/92	184.1	62	0	0.0
06/10/92	172.5	62	0	0.0
06/11/92	184.3	64	2	1.0
06/12/92	193.8	64	1	0.5
06/13/92	178.0	64	0	0.0
06/14/92	157.9	64	0	0.0
06/15/92	178.7	64	0	0.0
06/16/92	185.7	64	0	0.0
06/17/92	199.2	62	0	0.0
06/18/92	194/.1	60	0	0.0
06/19/92	193.6	60	1	0.5

Appendix Table 23.-- (continued)

Date	Daily average flow (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Percent of total detections
06/20/92	193.0	63	0	0.0
06/21/92	160.1	63	0	0.0
06/22/92	195.3	63	0	0.0
06/23/92	199.3	64	0	0.0
06/24/92	199.1	64	0	0.0
06/25/92	197.7	65	0	0.0
06/26/92	198.4	66	0	0.0
06/27/92	193.9	66	0	0.0
06/28/92	162.7	66	1	0.5
06/29/92	173.3	66	0	0.0
06/30/92	153.6	67	0	0.0
07/01/92	111.1	67	0	0.0
07/02/92	118.7	67	0	0.0
07/03/92	81.6	67	0	0.0
07/04/92	81.9	67	0	0.0
07/05/92	99.3	67	0	0.0
07/06/92	112.4	67	0	0.0
07/07/92	110.4	62	0	0.0
07/08/92	105.0	67	1	0.5
07/09/92	120.9	67	0	0.0
07/10/92	129.0	67	0	0.0
07/11/92	130.2	67	1	0.5
07/12/92	100.1	67	0	0.0
07/13/92	124.6	67	0	0.0
07/14/92	143.6	67	0	0.0
07/15/92	125.2	68	0	0.0
07/16/92	139.7	69	3	1.5
07/17/92	142.8	68	0	0.0
07/18/92	144.0	68	1	0.5
07/19/92	118.0	68	0	0.0
07/20/92	131.4	68	0	0.0